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THE

# OPHTHALMIC REVIEW

*A RECORD OF OPHTHALMIC SCIENCE*


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# CASE OF UPWARD COLOBOMA OF THE IRIS, ASSOCIATED WITH SUBLUXATION OF THE LENS DOWNWARDS.

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The following case is not only rare, but is interesting from a developmental and clinical standpoint, and therefore appears to me to be worth recording.

D. S., aged 57, presented himself at the Ophthalmic Department of the Dundee Royal Infirmary on March 31, 1897, complaining of blindness in both eyes. He is of slender build, but has always enjoyed excellent health, except when a boy of ten. At this time he suffered from inflammation of his right eye, and was treated as an in-patient for some three months. The right eye became gradually blind, and eventually ended in *atrophia bulbi*. The left eye, he assured us, had all along been free from any form of inflammatory trouble, and had never been operated on, but the vision had not been quite so good as that of other people. With the exception of atheromatous vessels at the wrist no organic lesion could be detected. His urine contained neither sugar nor albumen.

He is an umbrella maker by trade, and was able to earn a livelihood until three and a-half years ago. At that time the vision of the left eye had become so defective that he was unable to work by artificial light. Soon after this his sight got so much worse that he had to give up work altogether. He was then admitted into an ophthalmic hospital, and remained an in-patient for three weeks. During his stay in hospital, he informed us, his eye was examined every other day at least, but that

no treatment of any kind was applied. He was discharged from hospital with the advice that he should keep the little sight he had, and not undergo any operation as it would likely end in total blindness.

On being admitted into the Dundee Royal Infirmary I made the following notes:—In the left eye there is well marked arcus senilis surrounding the cornea. In the centre of the upper part of the iris there is a coloboma with symmetrical borders. As far as one can judge the coloboma is continued right up to the ciliary body, becoming slightly narrower as it passes upwards, being 5 mm. below and 4 mm. above. The pillars of the coloboma are directly continuous with the pupillary margin and show no break. The sphincter iridis appears to be prolonged into the pillars of the coloboma. The pupil is 5 mm. in diameter, but on admitting strong light into the eye a well-marked contraction of the pupil is observed, which extends along both pillars, supporting the view that the sphincter is prolonged into the pillars. Under homatropine and cocaine drops the pupil dilates only to 7·50 mm., although unaffected by synechiæ. On slight movement of the eye well-marked iridodonesis is seen. The anterior chamber is deeper than usual. The lens is uniformly opaque, and is dislocated downwards and backwards, the upper edge being visible about half way down the coloboma. Careful examination does not reveal the presence of any fibres of the suspensory ligament in the colobomatous area. It is impossible, on account of the arcus senilis, to note the condition of the ciliary body behind the coloboma, and for the same reason no view of the fundus is obtainable with the ophthalmoscope. The tension of the eyeball is normal, and perception and projection of light is good.

Before deciding on what should be done for him we kept him under very careful inspection for a fortnight. I soon convinced myself that if the lens could be got safely away the patient had a fair chance of useful vision. Fearing considerable loss of vitreous, and also the probability of the lens passing backwards either during or after the

corneal section, I thought couching might have been justifiable. Being, however, loath to revert to such an objectionable method of dealing with an opaque lens, I determined to remove it with the vectis, especially as I had been successful on previous occasions in removing dislocated lenses with that instrument.

He was prepared for extraction on April 14, but owing to gumminess on the dressing and along the edges of the eyelids, the operation was postponed. Nitrate of silver (2 per cent.) was applied daily to the palpebral conjunctiva for a few days, and then boric lotion for some days longer. On the 23rd the eye appeared perfectly clean, as shown by the absence of gumminess under the attesting dressing. With cocaine (5 per cent.) a 3 mm. flap with corneo-scleral incision was made. The speculum was not removed after the section was completed, but held forward, with spring released, by the left hand. The vectis was now inserted through the wound, and directed very quickly downwards and backwards so as to overtake and get behind the lens as it slipped backwards into the vitreous on the entrance of the vectis. Then by an equally quick forward and outward movement the lens was instantly snatched out. The speculum was then withdrawn and the eyelids were gently closed. No trace of vitreous was seen. After a short pause the eyelids were separated, when it was found that the inner pillar of the coloboma was displaced a good deal to the nasal side. An attempt was made with the spatula to replace it, but as there was a suggestion of vitreous on opening the lips of the corneal wound, we desisted from any further interference. The lips of the wound came into close apposition, and as far as could be ascertained at the time everything was satisfactory, the patient being able to see fingers easily. Sterilised normal saline solution (·6 per cent.) was employed before and after the operation for douching purposes, and the eye was dressed with an oval-shaped piece of sterilised surgeon's lint and a pad of cotton wool, the whole being held on by strips of adhesive rubber plaster. [This single plaster dressing we have employed

exclusively for all cataract and iridectomy operations during the past two years.] The eye made a speedy and uninterrupted recovery.

The last time he presented himself was on July 24, when the following notes were made:—The pupil and coloboma are jet black, and no trace of inflammatory trouble is visible. The outer pillar of the coloboma is displaced slightly inwards, so that the periphery of the coloboma is now 7·50 mm. broad. The pupil reacts well to light. The fundus appears normal, no evidence of a ciliary coloboma being detected with the ophthalmoscope. His L. V. is $\frac{6}{6}$ with + 10 D. sph., and with + 14 D. sph. he can read Jaeger No. 1 freely.

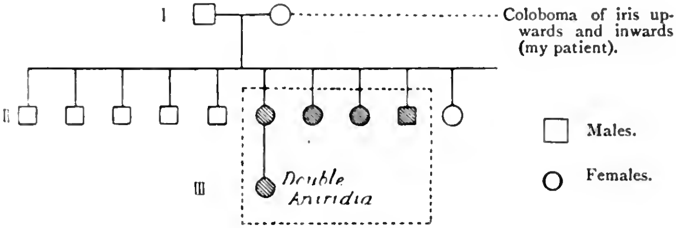
Cases of upward coloboma are exceedingly rare. Coloboma of the iris is almost always found in the lower half of the iris, and directed either downwards, or downwards with an inclination inwards or outwards, corresponding to the position of the fœtal cleft. In exceptional cases the defect has been found in other directions. Makrocki[1] has seen it inwards; Lang,[2] Manz, Nuel, Leplat, and Makrocki[3] have seen it outwards; Fage[4] and Pollock[5] upwards and inwards; Theobald,[6] Frost,[7] and Fage[8] upwards and outwards; and von Ammon, Theobald,[9] and Fuchs[10] directly upwards as in the present case. Manz and Rau have met with two colobomata in one eye. Some time ago I had under my care a case of bilateral coloboma directed inwards, in which case the right coloboma was about 3 mm. broader than the left, and no other congenital defect, with the exception of 2 D. of astigmatism, was observed. Lately I saw a case of extensive coloboma, or more correctly speaking partial aniridia, situated downwards and inwards in both eyes. The defect was symmetrical, and involved half of each iris, being associated with a narrow zone of opacity in the periphery of the lens. *Clinically* the case is of interest as illustrating a method of dealing successfully

with dislocated opaque lenses. In Taylor's vectis, which I employ, we have a most valuable instrument for removing the lens when the zonule is defective. With some operators the instrument is by no means a favourite, very probably owing to the way in which they employ it. I have seen it inserted with the caution and care with which a Graefe's knife is passed through a very shallow anterior chamber, and the result, as a rule, was bad, as might be expected. It must be used dexterously, fearlessly, and with a determination to remove the lens without fail. In doing this we must at the same time studiously avoid pressure on the globe throughout the operation, or at least attempt in every way to minimise this pressure. This can best be done by preventing the blepharostat from resting on the globe, by using the fixation forceps as little, or as gently, as possible during section, and by securing a very keen-edged knife for the corneal incision. Employed in this way and with these precautions against pressure on the globe, I have not lost vitreous, nor have I seen any inflammatory changes follow the operation. The recovery is invariably rapid and uninterrupted.

From the development standpoint the case is of more than ordinary interest, as the position of the coloboma must be in direct antagonism to the theory that (all) colobomata of the iris are caused by a deficient closure of the fœtal cleft. The defect in the iris in this case is above, whereas the fœtal cleft is below. It has been suggested by Pflüger that in the cases where the coloboma is situated in a direction other than that of the fœtal cleft, some rotation of the stalk of the optic vesicle has occurred during early fœtal life. If that were so, one would expect to find the macular region on the nasal side of the optic disc, instead of on the temporal side. Makrocki, adhering to its connection with the fœtal cleft, tries to explain the situation of the

coloboma in such cases by supposing the fœtal cleft to be abnormally placed. I am not aware, however, that such a transposition has been observed embryologically. Neither of these hypotheses would explain the presence of two colobomata in one eye, as observed by Manz and Rau, or of a horizontal coloboma of the iris with a coloboma of the choroid at right angles to it. Clearly, then, we must look for some other explanation regarding the causation of these upward colobomata than that associated with the fœtal cleft.

I have recently seen a case of iris coloboma upwards and inwards. In this there is a bridge of iris tissue at the pupillary end of the coloboma, which appears to me to be the sphincter only. The position of the coloboma corresponds to the figure II. on a watch dial; the pillars of it become again united just under the *limbus corneæ*. There is an interesting family history of iris defect extending through three generations.




Manz suggests that defects in the iris, such as aniridia, are due to the abnormal adhesion, or late separation, of the lens and cornea, whereby the iris is mechanically prevented from pushing its way inwards. Treacher Collins[11] agrees with Manz regarding the cause of aniridia, and states that coloboma of the iris is occasioned by the late separation of the lens and cornea being localised, instead of being general, as in aniridia. This theory of localised late separation of the lens from the cornea might explain a partial coloboma of the iris in

any part of its circumference. [By partial coloboma I mean a defect in the iris which does not extend backwards to the ciliary body, but where a distinct bridge of iris tissue can be seen at the base of the coloboma.] But it does not explain a complete coloboma, which extends backwards to the ciliary body, as in the present case. In early fœtal life it is true that the lens is adherent, or in juxtaposition, to the cornea, but this adhesion is limited to an area at and around the anterior pole of the lens, and does not extend to the periphery. The convexity of the anterior surface of the lens (in fœtal life) is greater than the concavity of the posterior surface of the cornea, hence it is physically impossible for the lens to be adherent to the cornea at its periphery. We find therefore, between the cornea and lens at their periphery, a triangular or wedge-shaped space all round, even at the time when the lens is still in contact with the cornea. Into this triangular space, which has its base next to the ciliary body, there is ample room for the iris to develop, supposing the lens to be still adherent to the cornea. Further, we know that the appearance of the iris, as a bud growing forwards from the rudimentary choroid, is not seen till after the closure of the fœtal cleft, and that this closure is accomplished after the time the lens becomes separated normally from the cornea. It will thus be seen that there is, comparatively speaking, a considerable lapse of time between the separation of the lens from the cornea, and the beginning of the development of the iris. If, then, there should exist that delayed separation of the lens from the cornea, required by Manz and Collins's theory, there is a wide margin during which the delayed separation would have ample time to become complete, before the iris begins to develop, even supposing the triangular or wedge-shaped space referred to did not exist. Again, it is impossible to explain by Collins's theory

the form of coloboma known as the bridge coloboma, described by Fuchs,[10] where the pupil is separated from the coloboma by a narrow thread of iris tissue, which stretches like a bridge from one pillar of the coloboma to the other, and also Benson's case,[12] where a bridge of iris tissue connected the pillars halfway down.

This mechanical obstruction theory, as I might term it, appears therefore unsatisfactory, so that our knowledge of the causation of these abnormally placed iris colobomata is as defective as before. But these abnormally placed cases are only rarely met with, the great majority of cases of iris coloboma being situated downwards, or downwards with a slight inclination either outwards or inwards. It is therefore probable that the causation of these abnormal cases is different from that of the ordinary downward type, so that a theory which explains the latter satisfactorily need not be discarded because it fails to explain these very exceptional cases. Take, for example, the case of downward coloboma of the choroid. It is now, I think, universally believed that the usual or downward type of choroidal coloboma is due to an irregularity in the closure of the fœtal cleft, but although the other and rarer forms of choroidal coloboma cannot be traced to it, we do not doubt the connection between the downward type and the fœtal cleft. It is hardly possible to imagine the downward position of iris coloboma to be a mere coincidence, without any relation to the fœtal cleft, when we think of similar developmental anomalies elsewhere. This relation to the fœtal cleft must not, however, be considered a direct one, as was formerly supposed. It is now well known that in the fœtal iris there is no cleft during any period of its development, for the iris, which is a prolongation forwards of the ciliary body, is not formed till after the closure of the fœtal cleft. But if the closure

of the cleft be more or less incomplete at the time that the iris is developing, it will readily be seen how the iris must necessarily become affected to a greater or less extent at the part opposite the ciliary ridge which corresponds to the region of the fœtal cleft. There is, therefore, no necessity for discarding the old theory that downward coloboma of the iris is produced by an irregularity in the closure of the fœtal cleft. In the case of abnormally placed colobomata, such as the present case, some explanation other than that connected with the fœtal cleft is required. It appears to me that a process somewhat analogous to that put foward to explain the downward type is sufficient. In these cases I have just shown that the essential point in the formation of the coloboma connected with the fœtal cleft is the gap in the ciliary body (at the time the iris is being formed). Now, any irregularity in the development of the margin of the secondary optic cup at any part of its circumference, involving subsequently a delayed or an imperfect development or a non-development of the ciliary body and processes, would explain a partial or complete coloboma in the iris, independently of the fœtal cleft. That such an irregularity in the development of the ciliary body at any part occurs, appears to be highly probable when we consider the possibilities of irregularity in the involution of the primary optic vesicle to form the secondary optic cup, and more especially seeing that we have numerous examples of developmental anomalies in other parts or organs of the body whereby the part or organ remains either undeveloped or under-developed.

This theory of *impaired development at any part of the ciliary ridge* would explain the coloboma in the zonule in this case. For if during the process of development of the zonule there is a gap in the ciliary

body at any part of its circumference, it is impossible for the zonule to be formed opposite the gap (there being no anchorage). Now the extent of the gap in the ciliary body would determine the extent of the gap in the fibres of the zonule, and if the gap in the ciliary body became subsequently obliterated, the margins of the zonular coloboma might not only become approximated, but might close in enough to escape detection altogether. In this way one can see how a permanent weakness, short of allowing subluxation of the lens, could occur in any part of the zonule, and remain throughout life without allowing subluxation of the lens to occur, except in the event of some exciting cause, whereby undue strain was exerted on the weakened part of the zonule. It will also be seen that this theory is applicable to the form known as "key hole" and "bridge coloboma." For if we take a developing iris with a coloboma in it, the rapidly dividing cells at the margins of the gap would tend to grow inwards in order to fill up the deficiency. This approximation of the pillars of the coloboma would, however, be mechanically prevented at the periphery of the iris on account of the gap in the ciliary body, and would only be permitted at the pupillary end, so that eventually the coloboma would become narrower there, and assume the shape known as "key hole," or, still better, "Scotch thistle." Again, should the tendency to fill up the gap proceed further, it is easy to see how the two pillars could become united at or near the pupillary end, and leave a permanent bridge of iris tissue at that part, as we see in some forms of cleft palate.

In conclusion, I may point out how readily a double iris coloboma can be explained by this theory by assuming a double centre of irregular development

of the ciliary ridge; whereas it is impossible (on physical grounds) to explain the condition by "the mechanical obstruction theory."

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## CAMILLE FROMAGET and HENRY BORDIER (Bordeaux). Researches Regarding Visual Acuity and Amplitude of Accommodation. *Archives d'Ophtalmologie, October*, 1897.

The second of the authors of this paper published in 1893 certain results which he had obtained by testing the visual acuity and its variations with the age of the patient, which results were not quite in accordance with accepted teaching, and the two having examined the eyes, more than 900 in number, of the pupils of the "Lycée" of Bordeaux, now record their experiences regarding (1) visual acuity, and (2) amplitude of accommodation.

(1) THE VISUAL ACUITY was measured in a room seven metres in length, the walls and ceiling of which were painted white, the apartment illuminated by three large

windows; only one eye was, of course, tested at a time, the other being covered by a screen. The observers record the visual acuity of hypermetropes, emmetropes, and corrected myopes, and have omitted from their standards those myopic eyes which presented fundal alterations, and those in which astigmatism was found to exist. They have thought it right not to exclude the non-malignant myopias, because such are healthy as regards visual functions, and, as a matter of fact, sometimes possess better sight than emmetropic eyes of the same age. Though they avoided examination in bad light, they have taken the precaution to note in each case the state of the weather and the time of day at which the investigation was made. The state of the sky has, however, been found to have little influence on visual acuity when clouds are not dark grey or black; whether the sky is clear and blue or covered with light white clouds is of no moment. On enquiry as to the weather during the examination of those eyes which actually obtained the best vision, it is found that the sky was lightly clouded, that is, there was no actual sunshine at the time; their results are in this respect in agreement with those of Klein.

The curve obtained by the graphic representation of the vision of 960 eyes, aged from 5 to 21 years, shows that visual acuity rises to its maximum at the age of 14 or 15 years, then very gradually descends. It appears from these results that the opinion held by some that visual acuity diminishes from the first years of life onwards to old age is not correct.

(2) The Amplitude of Accommodation has often been assumed to be independent of the condition of refraction, that is to say, that at any given age every person, be he hypermetropic, emmetropic, or myopic, possesses the same range of accommodative power. But upon what foundation does this assertion rest? The authors have searched the works of Donders for any statement or record of experiences on which this might be based, and are obliged to admit that there is nothing there which permits one to impute such an assertion to him. If he did measure the amplitude of accommodation in ametropes he does not

record it; the eyes which he examined and tested in order to construct his famous curve were emmetropic, slightly hypermetropic, or myopic to the extent of 1 D. They quote from Donders' own categorical statements in proof of this, but at the same time they admit that it is possible that slight error may have crept into his results from Donders making use of cases in which a certain degree of latent hypermetropia was present.

When taking into account certain slight errors into which Donders fell in the determination of the position of the *punctum remotum*, we ought also to say a little as to the method employed by him for the determination of the situation of the *punctum proximum*. As is well known, his procedure was to employ a thread optometer, consisting of a small frame in which fine black threads were fixed running vertically and horizontally, and furnished with a tape measure which unwound as the frame was made to recede from the eye; this frame being withdrawn gradually from the eye until the threads were just perfectly visible, the distance registered by the measure was read off. This method he found to answer very well and very exactly, since the fine lines appear doubled when at all out of focus, but a control experiment can be carried out by means of small print. But how great soever may be the skill of the observer and the intelligence of the patient, this mode of conducting the investigation is not without liability to error, and a degree of error which, in the estimation of the *punctum proximum*, may be serious, even amounting to a full dioptre; it does not therefore give us mathematical exactitude. Fromaget and Bordier have examined the static refraction with the ophthalmoscope by direct estimation, by retinoscopy, and in a very few cases of myopia by Donders' method; for the determination of the *punctum proximum* they have employed Badal's optometer. Donders measured the distance from that point to the surface of the cornea, the two present authors employed the optical centre of the eye as their base. By removing the eye-piece of the instrument and applying the tube to the eye of the patient, one can easily cause the focus of the lens

to coincide with the optical centre of the eye. The diminution of visual acuity the moment the *punctum proximum* is passed, is still more easily observed than is the case with the thread optometer; and lastly, the gradation of the instrument enables one to detect a difference of 0·25 D., a sufficiently precise result.

One of the two authors estimated the *punctum remotum*, the other determined the position of the *punctum proximum*, for each of 408 students, who fell into the following classes: hypermetropes 156, emmetropes 179, myopes 73; all those who had astigmatism, and all whose vision was bad or indifferent were excluded from the list. The age of the lads varied from 7 to 21 years; below the age of 10 almost all were hypermetropes; indeed, this seems to be almost the normal condition up to that period of life. Donders, it is to be observed, only included patients after the age of 10 in his investigations. The amplitude of accommodation was found by the two authors to be 14·40 D. at 7 years, 13·80 D. at 10 years. The 73 myopes were all above the age of 13 years, and their numbers increased as the higher classes in the institution were reached.

At 10 years of age the amplitude of accommodation of the hypermetropes and the emmetropes is identical, but soon that of the emmetrope falls below that of the other, and at 20 years the amplitude of the hypermetrope is 10·3, that of the emmetrope one dioptre less. The amplitude of the myope is about 2 D. less than that of the hypermetrope of the same age. The degree of admissible hypermetropia for the purposes of this examination was up to 2·5 D., that of the myopia up to 4 D.

The following is the table of results for each year:—

*Amplitude of accommodation in* D.

| | H. | E. | M. |
|---|---|---|---|
| From 7 to 8 years | 14·33 | — | — |
| ,, 8 ,, 9 ,, | 14·12 | — | — |
| ,, 9 ,, 10 ,, | 14·00 | — | — |
| ,, 10 ,, 11 ,, | 13·50 | 13·50 | — |
| ,, 11 ,, 12 ,, | 13·50 | 13·45 | — |
| ,, 12 ,, 13 ,, | 12·95 | 12·65 | — |

| | H. | E. | M. |
|---|---|---|---|
| From 13 to 14 years ... | 12·41 ... | 12·21 ... | — |
| „ 14 „ 15 „ ... | 12·48 ... | 11·61 ... | 10·33 |
| „ 15 „ 16 „ ... | 11·67 ... | 11·25 ... | 10·09 |
| „ 16 „ 17 „ ... | 11·18 ... | 10·41 ... | 9·75 |
| „ 17 „ 18 „ ... | 11·11 ... | 10·35 ... | 9·01 |
| „ 18 „ 19 „ ... | 10·80 ... | 9·83 ... | 8·92 |
| „ 19 „ 20 „ ... | 10·40 ... | 9·67 ... | 8·40 |
| „ 20 „ 21 „ ... | 10·36 ... | 9·62 ... | 8·37 |

It is evident from the foregoing that among those 408 youths the amplitude of accommodation varied according to a fairly constant ratio with the condition of refraction. In order to ascertain whether this state of affairs held good in after life, whether the amplitude of accommodation, in other words, is at all ages greater in a hypermetrope than in an emmetrope, and greater in an emmetrope than in a myope, the authors proceeded to examine students between the ages of 20 and 30, using the same system as in the cases of the younger patients for the determination of the *puncta*. They have thus examined 250 persons, and have found the same laws to hold good, that is, the amplitude of the hypermetrope (of not more than 2 D.) is slightly greater than that of the emmetrope, and his again is slightly in excess of that of the myope (of less than 4 D.). But though they had thus accumulated the records of 800 observations, all tending to show the truth of the statement that the dynamic refraction varies with the static, proof was still lacking that the difference in refraction was the *cause* of the difference in amplitude. Does variation of the *punctum remotum* by the employment of correcting lenses alter the degree of amplitude? We can ascertain this by determination of the amplitude in ametropes who wear correcting lenses, and we discover that by wearing correcting glasses, by setting back his *punctum remotum* to infinity, the ametrope places himself for the future in the same position as an emmetrope; the authors believe they have collected abundant statistics to prove this fact to be true. Those myopes who wear no correcting glasses have an amplitude inferior to that of emmetropes, those who do

wear them have equal amplitude. They even assert that a myope who wears lenses which over-correct his abnormality may raise his amplitude to that of a hypermetrope, and that this may actually be shown in the different eyes of an anisometrope.

It is a noteworthy fact that the amplitude is not in accord with the degree of ametropia, and it is also interesting to observe that that of the elder students who were myopic was distinctly superior to that of the myopic younger scholars, just because the latter did not wear their correcting glasses at all or wore them only for distant objects, while the former wore them constantly. Thus it is demonstrable that a corrected myope of 21 has greater amplitude than an uncorrected myope of 19. The same observations hold true *mutatis mutandis* of hypermetropes. It is the constant and free use of the ciliary muscle which leads to its hypertrophy.

With the view of still further carrying out their investigations, the authors examined a number of soldiers, aged from 21 to 25, and found their amplitude less than that of students of corresponding age, manifestly because their ciliary muscles were less constantly put in operation. The amplitude of accommodation is proportional to the accommodative work done.

One dare no longer say, then, that if he knows the age of any one he knows what his amplitude of accommodation is, for there are four other considerations at least to be taken into account: (*a*) the amplitude varies with the occupation—it will be less in a peasant than in a man of letters; (*b*) it varies with the general condition of health; (*c*) there is an element of "personal equation"; (*d*) it varies with the static refraction.

W. G. S.

**ALBERT TERSON (Paris). Partial Atrophy of the Optic Nerves following an Extensive Burn which was treated with Iodoform.** *Archives d' Ophtalmologie, October*, 1897.

The unforeseen occurrence of lesions of the fundus arising in the course of treatment of extensive surface burns is still but little recognised as a fact; but before discussing the question at large the author presents the following case:—

Madame C., aged 48, was the victim four years previously of a lamp accident, whereby she was extensively burnt over the thighs, abdomen, and arms. For the first fortnight she was treated with moist dressings, probably saturated with boracic lotion, after which time iodoform gauze was applied. The patient, who up to this time had shown no head symptoms except some headache, nor any sign of iodoform poisoning, was attacked about three weeks after this change in the mode of dressing with extreme enfeeblement of vision without any external sign of disease. This rose to its maximum in about a week and has remained the same for four years, in spite of every variety of treatment. She is quite able to guide herself, though distant vision is but indifferent and she is unable to read fine print. She has been treated with subcutaneous injections of strychnine, of mercury, and of artificial serum, with iodide of potassium, with the milk cure, with electricity, but without effect. With the ophthalmoscope the discs are seen to be very pale, particularly in the temporal region. Nothing abnormal is visible at the macula or elsewhere in the fundus; there is nothing but a partial atrophy of the nerve, the portion affected being the macular bundle of fibres. The appearances exactly resemble those seen in cases of chronic alcoholism, and a number of other toxic conditions. Vision is $\frac{1}{8}$ with right eye, $\frac{1}{6}$ with left eye; the fields of vision not reduced present a central scotoma less absolute than might have been expected; colours, though they appear faded in that area, are still perceived, but less clearly than in the ex-

centric regions. No. 7 of de Wecker's scale can be read; lenses do not improve vision; the pupil reactions are normal.

Such lesions of the eye consequent upon extensive burning are very interesting, and may be a great deal more common than is generally supposed, because sometimes the patients die of the original injury, and the state of vision is not enquired into, and sometimes the cause of the eye symptoms is not recognised.

Mooren in 1858 described a case in which, as the result of an extensive burn, a great number of hæmorrhages into the retina occurred; he has also recorded cases of optic neuritis, retinitis, and choroido-retinitis without hæmorrhages and without albuminuria; and he says that it is not necessarily a large burn which gives rise to the condition, mentioning a case in which quite a slight burn of the two legs was followed by double neuro-retinitis. He even declares that he has observed a double neuro-retinitis produced by sunstroke. Sauvineau and Horner have recorded cases also of neuritis and of retinal hæmorrhages following burns, and Wagenmann mentions a very singular one in which hæmorrhagic retinitis resulted from a fall into a cauldron of boiling sugar. Gradually the two discs, which had slowly become infiltrated, lost colour, but the hæmorrhages disappeared without leaving any trace. It is noteworthy that these burns had been treated with iodoform powder.

Iodoform has been several times suspected of being the cause of these ocular troubles.

Hirschberg and Küster record the instance of a girl of 16, who, as the result of iodoform dressing applied after an operation on the hip-joint, acquired a bilateral central scotoma, similar to cases of toxic (alcohol, tobacco) amblyopia. The fundus was and remained normal, and the functional trouble disappeared on cessation of the use of iodoform. The pupils were dilated, though they are generally contracted in iodoform poisoning. Priestley Smith recorded in this Journal (1893, p. 101), a perfectly typical case of iodoform poisoning in which eye symptoms

were a prominent feature; in this case the iodoform had been administered internally. In 1893, also, Valude reported the case of a child, 12 years of age, who two years previously had been severely burnt over the right side of the thorax, the outer part of the right arm and thigh, and the left thigh. The patient was dressed with iodoform, and there was abundant suppuration with rise of temperature. Eight months after the accident diarrhœa and headache set in, with vomiting and rapid reduction of vision. On substitution of salol for iodoform the general condition improved, but a certain amount of amblyopia remained. Valude observed white atrophy of the nerves, double and complete, without any post-neuritic halo. The pupils reacted well to light, the right eye counted fingers at 10 cm., the left at about double that distance; colours were not perceived at all.

In view of such facts as these, and on comparison of the behavour of cases treated with iodoform with those treated without that drug, what view ought one to take of the pathology of the condition? Is it due to the burn or to the action of the iodoform? In the cases recorded hitherto, the eye symptoms produced by iodoform have shown themselves under the form of simple toxic amblyopia or a partial atrophy of the optic nerve. Terson believes these differences merely to represent varying degrees of severity of the condition; the slighter cases, from which recovery readily occurs, reduce themselves to a toxic amblyopia with central scotoma, indicating that the macula and the macular bundle have undergone a functional alteration; in more severe cases atrophy of the macular bundle is manifest as a decolorised patch in the temporal region of the disc, which in the extreme cases becomes entirely pale. Terson has seen analogous cases in which a very alcoholic patient has in a few days, and without any head symptoms, developed blindness and white atrophy without any trace of neuritis, with no other cause discoverable than over-indulgence in absinthe.

The accounts of cases of iodoform intoxication show that it acts largely upon the nerve centres and may produce a

delirium simulating that of severe meningitis; and it mus be remembered that the optic nerves are histologically and embryologically part and parcel of the cerebral tissue. As to burns, their effects upon the retina and optic apparatus may be inflammatory merely. The cases of Mooren and other authors are simply of this nature, neuro-retinitis highly suggestive of the syphilitic variety; the hæmorrhages present in particular resemble those in septic retinitis. We are unaware, too, in the retinitis of diabetes and of Bright's disease, how much is to be attributed to inflammation, auto-infection and dystrophy. For this one would require to know if the blood in these dyscrasiæ possessed toxic or infective qualities capable of acting upon retinal vessels previously disposed towards arterio-sclerosis, &c. And it is necessary to be careful as to one's conclusions in view of the close affinities between certain bacterial ptomaines and certain auto-toxines.

Simple congestion produced by the rush of blood from the peripheral regions to the central, can hardly explain even the retinal hæmorrhages, and certainly not the neuro-retinitis. On the other hand experiments and researches by Kijanitzen, Baarden, Barré and others, show that the blood of a person injured by burning is in a toxic condition, by reason of the cessation or diminution of excretion and elimination by the skin and kidneys; so that for this reason and sometimes in consequence of nephritis, the organism becomes loaded with its own toxines, to say nothing of those which may be absorbed from the raw burnt surface. The blood can thus acquire properties tending to produce inflammation, or at least irritation; it is on these grounds that Barré advocates treatment by bleeding and injection of artificial serum with the idea of diluting the toxines, at the same time keeping the patient on milk diet, and employing purgatives and oxygenation. Be that as it may, the lesions of the ocular apparatus are very often of the nature of true inflammation, but yet certain of the manifestations are much more suggestive of the atrophy resulting from alcoholic or other intoxication. In this connection, for reasons just given, it

is manifest that it is particularly needful to distinguish carefully between cases treated with iodoform and those treated without it. Terson's own case he has no doubt was one of iodoform poisoning, and he warns surgeons to be on their guard against the occurrence of such an accident in their practice.

W. G. S.

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**S. BAUDRY (Lille). A New and Certain Method of producing Monocular Diplopia by means of a Simple Prism, and its Application in pretended Blindness of one Eye.** *Wien. Klin. Wochens., x. Jahrg.* (No. 41).

The usual methods of detecting simulated blindness of one eye still leave something to be desired in the case of intelligent malingerers, especially of such as have some knowledge of optics.

Graefe's method of producing monocular, succeeded by binocular diplopia, by means of a prism is rather difficult if the apex of the prism is employed. Baudry claims to have been the first to call attention, in 1881, to the advantage of using the base of the prism in this test. A simple demonstration shows that in order to cause monocular diplopia by covering one half of the pupil with the apical portion of the prism the diameter of the pupil must exceed 2 mm.; the prism must be brought slowly before the pupil, and above all very close to the cornea, and it and the eye must be kept immovable. The subject moreover must be intelligent. If the pupil contracts a little, or if the eye or hand carrying the prism makes the slightest movement the diplopia vanishes. On the other hand, when the basal portion is employed the pupil may

be somewhat smaller, and the prism can be held several centimetres from the eye.

Monocular diplopia can also be produced by other methods, such as the doubly refracting crystal of Iceland spar, a double prism, &c.

The principal disadvantages of all prism tests are: marked difference in distinctness and colour between the direct and the prismatic image, the edges of the latter are coloured. The image furnished by a doubly refracting prism especially suffers in intensity because the light is divided into two equal pencils. The simulator may learn from the shape of the prism to know whether a single or double prism is held before the eye, and may be able to follow and understand the manipulations of the apparatus. Baudrey's method overcomes most of these disadvantages entirely. Both images are so similar that the subject is unable to distinguish the one from the other, or to recognise whether the double images are of binocular or monocular origin. Finally the apparatus is so constructed that the malingerer, even if he understands its mechanism exactly, cannot tell whether the prism as a whole, or only its base, is held before the seeing eye. The test light is covered with a dark red glass to abolish the dispersion, making the images of the same colour, whether the diplopia be monocular or binocular. In the latter case the entire pupil receives the light, whereas in monocular diplopia each image is formed by the light entering only half of the pupil, hence the intensity in binocular diplopia is double that in monocular. This could be easily remedied by reducing the aperture of the diaphragm one half the instant binocular diplopia is made to replace the monocular, but it would require some sort of covering for the alleged defective eye, and this for obvious reasons is best avoided.

Baudry's apparatus consists of a prism supplemented at its base by the juxtaposition of a piece of plane glass equal in thickness to the width of the base; the prism itself is divided near its centre by a section parallel to the base; it thus consists of three pieces, the whole shaped like a

piece of the edge of bevelled glass. The apparatus is mounted in a brass cell, covered on both sides. The cover is pierced on each side by a central opening of 6 and 3 mm. apertures respectively. By a simple mechanism the three pieces of glass slide in the mounting, so that one or other of the two dividing lines with the parts of the glass adjacent may thus be placed before the pupil of the seeing eye,—in other words, either the base of the prism and the piece of plane glass adjacent or the two pieces of the prism itself. Inasmuch as the two dividing lines and adjacent parts look exactly alike, monocular and binocular diplopia can be produced with the greatest ease and without the subject's knowing, even if acquainted with the apparatus, what variety of diplopia (whether binocular or monocular) is present at any given instant.

The method of using the apparatus is simple. The eye that is alleged to be blind is lightly covered by the examiner's hand, and the subject asked to look at the test flame 2 or 3 metres distant and covered with the dark red glass. The apparatus is then placed before the seeing eye, so as to bring the dividing line between the base of the prism and the piece of plane glass into coincidence with the horizontal diameter of the pupil. The patient sees two lights. The instrument is now removed and adjusted, without his knowledge, so as to bring the dividing line in the prism itself before the central aperture in the metal cell, and placed again before the seeing eye, the other eye being left uncovered, apparently unintentionally. If the patient now sees double he is convicted, for the diplopia is binocular. If the simulator stubbornly denies the existence of diplopia at first, both phases of the procedure may be repeated in reversed succession.

T. B. SCHNEIDEMAN.

O. LANGE. Unilateral Congenital Microphthalmos: its Anatomy and Pathogeny. *v. Graefe's Archiv. f. Oph., xliv.*, 1.

Dr. Lange here gives an account of a case of congenital microphthalmos presenting some unusual features.

The patient was a girl of 10 when she first came under observation. There was no family history of malformations, and the parents were healthy. The *right* eye was represented by a small flattened globe about the size of a small cherry, lying deep in the conjunctival sac, the lids being well developed. The cornea, 5 mm. in diameter, was quite clear; the iris was brown; the pupil, small and round, was filled by the chalky white remnants of the lens. The eye had no perception of light. The *left* eye appeared natural, and except that it was myopic to the extent of 2·5 D., with a small crescent, presented no abnormality. Dr. Lange suggested that the patient's appearance might be improved by removing the small globe and wearing an artificial eye in the socket, but as the parents would not consent to excision the artificial eye was worn over the globe. It was borne well for two years, when the right eye became for the first time congested, and symptoms of sympathetic irritation appeared in the left. The right was excised, with immediate subsidence of the symptoms, and a glass eye was subsequently worn with comfort.

The right eye on excision strikingly resembled a shrunken phthisical globe; it was flattened and irregular in form, and adherent to the orbital tissue. After hardening it was cut in a series of horizontal sections, from which the topographical anatomy could be accurately determined. The *cornea* was practically normal in structure, and covered posteriorly by a well-developed Descemet's membrane. The *sclerotic* coat was greatly thickened, and scar-like in texture. The thickening was greatest posteriorly, around the optic nerve, where it amounted to a third of the whole diameter of the globe, and here a considerable amount of smooth muscle fibre in irregularly interlacing bundles was mingled with its substance. In this region also there was

included in the sclera a small well-defined mass of fat, lying just behind the choroid and embracing the optic nerve on its upper, outer and lower sides. The *choroid* showed considerable thickening, especially posteriorly, with some dilatation of its large vessels. A small ring of bone had been developed in its substance around the optic nerve entrance. Its vitreous lamina showed some colloid knobs; the retinal pigment layer was adherent to it, and in places proliferated. The *ciliary processes* were displaced forwards; both these and the *iris* had a very thick layer of uveal pigment. The *lens* was represented by some broken-down fragments only. The *optic nerve* was thick and fibroid, and showed no trace of nerve tubes. Between its pial sheath and the nerve was a layer of pigment, which could be traced forward into continuity with the retinal pigment layer lining the choroid. The retina, wholly detached, folded up, and thickened by new connective tissue, showed only here and there traces of its various layers: masses of pigment and a few cysts were present in it. It was lined, next to the vitreous space, by a thick layer of fibrillated connective tissue. The *vitreous* space itself was reduced to a cavity about 3 mm. in diameter, and was filled by a yellowish mass which, under the microscope, was found to consist of well-developed fat, the cells being regular in size, closely pressed together, with some scanty connective tissue interspersed. Passing directly forward into the mass of fat from the head of the optic nerve was the hyaloid artery, having thick muscular walls and dividing the fat into numerous twigs. Just behind the position of the lens these twigs were especially numerous, convoluted and dilated, and were embedded in connective tissue, which also contained numerous single-nucleus round cells and some fat cells.

By continuing the series of sections downwards it was found that towards the level of the lower margin of the cornea another mass of fat began to make its appearance, interposed between the ciliary muscle in front and the pigment layer of the ciliary body behind, and pushing the latter backwards towards the interior of the globe. Further

sections showed this to be the beginning of a ridge which passed from behind forwards and a little outwards; it was composed of fatty tissue and vessels which replaced the choroid proper, while it was covered on its internal surface by the intact retinal pigment layer. The sclerotic passed continuously over it externally. It was not connected with either the fatty mass in the vitreous space or that surrounding the optic nerve.

Dr. Lange points out that this eye presents evidence of two sets of pathological processes, an *inflammatory* and *metaplastic*. The signs of the former are found in the fibrous thickening of the sclera, optic nerve, retina and outer layers of the vitreous, the wandering of pigment into the retina and optic nerve-sheath, the degenerative changes in the vascular coats and in the lens; of the latter in the abnormal development of fat in the vitreous, choroid and optic nerve-sheath. He regards this metaplastic process as having played a primary part in the production of the malformation. The mesoblastic tissue filling the optic cup, instead of forming the vitreous body, has for some unknown reason developed into fat; once formed it seems as if this abnormal constituent of the eye had acted as a foreign body and set up the chronic inflammatory changes found in the various coats. The ridge of the fat in the choroid evidently marks the choroidal fissure, while that in connection with the optic nerve has probably been derived from the process of mesoblast passing into the cleft in the optic stalk, which has undergone the same metamorphosis as that filling the optic cup. That the fatty change had taken place subsequently to the closing in of the secondary optic vesicle is indicated by the fact that the retinal layers are intact; it is evident, too, that the coats of the eye had attained a fairly complete development before the inflammatory processes occurred in them.

Although this specimen appears to be unique in respect of the conversion of the vitreous into fat, the author mentions two cases which showed an approach towards a similar condition (Manz, *Graefe's Archiv.*, *xxvi.*, 1, and v. Grolmann, *Graefe's Archiv.*, *xxxv.*, 3). In each of these

the vitreous of a microphthalmic eye was represented by fibrillar connective tissue in which a certain number of fat cells were present.

Dr. Lange's case is fully illustrated by microscopic drawings and diagrammatic sections.

W. G. LAWS.

## COLLEGE OF PHYSICIANS OF PHILADELPHIA, OPHTHALMOLOGICAL SECTION.

NOVEMBER 16, 1897.

Dr. S. D. Risley reported a *Case of Ocular Disturbance from Injuries to the Head.* There was blindness in the left eye, with marked swelling of the optic nerve, a recent hæmorrhage at the macula, floating vitreous opacities, and an extensive detachment, probably of both choroid and retina, below. There were, also, in the upper temporal quadrant of the fundus, radiating grey-white streaks, one of which resembled the late appearance after rupture of the choroid, and others appeared to be folds of detached retina. The changes had followed a blow received one year before with a baseball bat on the left side of the head, in front of the ear. There was no sign to indicate the exact site of the impact. He was rendered unconscious by the injury, and remained under treatment for three weeks. He now has frequent convulsive attacks affecting the right side, which begin in the toes of the right foot, rapidly ascend the leg to the right arm, ending with twitching of the left side of the face and severe occipital pain.

This case was the last of a series of five, in which blindness in one eye had followed blows or injuries to the anterior portion of the skull. Case 1 was that of a young child who had fallen, striking the left infra-orbital ridge.

In three weeks atrophy of the left optic nerve had begun, and became complete with total blindness in the left eye. There were no hæmorrhages or other ocular changes. Case 2 was that of an elderly man who had beginning atrophy of the optic nerve with whitish splotches and gray infiltration in and around the macular region, following a severe blow on the outer angle of the left supra-orbital ridge. The atrophy became complete. There were no hæmorrhages in the fundus and no detachment of the retina. Case 3 was that of a man who was struck on the anterior part of the top of the head by a falling timber, which felled him. A short time after he complained of failing vision in the right eye. There were fine granular changes with slight grey infiltration in the macular region and incipient atrophy of the optic nerve with some contraction of the visual field. Both the contraction of the field and the atrophy progressed for some weeks and then became stationary, resulting in a marked and permanent impairment of vision but not in total blindness. Case 4 was that of a farmer who was struck in the left temporal fossa by a steel tooth of a horse-rake. The temporal plate of the orbit was probably fractured. Two months after the injury there was well advanced atrophy of the optic nerve with only qualitative perception of light and the remains of extensive absorbing hæmorrhages throughout the fundus, large white patches here and there, and a partially absorbed hæmorrhage at the macula.

The mode by which this class of injuries causes blindness furnishes an interesting subject of inquiry. The changes in the fundus suggest, in some cases, thrombosis, but this condition does not explain those in which the blindness ensued from simple atrophy of the optic nerve. The supposition of injury to the nerve caused by splinters of bone from fracture of the orbital plate, or by pressure in the foramen at the time of the blow, or by post-ocular hæmorrhage, is plausible. It is also possible that a thrombosis, if present, may have been produced by direct injury to the nerve. In the case reported before the Section in the spring of the present year, where total

blindness followed the discharge of a gun near the side of the head, from detachment of the lower half of the choroid and retina, blindness gradually ensued, as in the case reported to-night, from optic-nerve atrophy as a sequel to, probably, retro-bulbar hæmorrhage.

Dr. Jackson had seen a case of injury of the brow with extensive hæmorrhage into the orbit, which had caused protrusion and complete immobility of the eyeball, with absolute blindness within forty-eight hours. During the first few days no intra-ocular lesion was detected, except a very marked grey opacity of the retina with swelling. As this subsided, choroidal disturbances were found throughout the fundus with extensive hæmorrhages in the upper-inner portion. The choroidal changes went on to atrophy and pigment absorption, and the eye remained blind, but regained almost normal movements.

Dr. de Schweinitz reported the case of a girl who fell, striking her head, and was found partly unconscious. A day later she complained of blindness. The right retina was bluish-grey with no interruption of the retinal circulation. In a few days the retinal haze disappeared and was succeeded by choroidal changes and complete blindness with white optic disc. The lesion in all probability was a hæmorrhage in the sheath of the optic nerve.

Dr. W. C. Posey presented a *Case of Metastatic Uveitis in both Eyes causing Blindness, resulting from an intense Inflammation of the Nose and its Accessory Sinuses.* A woman, aged 27, had been for several years subjected to the fumes of sulphuric acid, oxalic acid, and chlorine gas while working in a steam laundry. A few months after engaging in this occupation she had a sense of irritation in the nose and tingling in both hands. The nasal inflammation became worse until there was a profuse discharge from the nares and soreness of the mouth and nose. After some months the nasal symptoms subsided, but her eyes became inflamed, and vision, which had begun to fail, was entirely lost in two years. The conjunctivæ were healthy, the corneæ clear, save for a small nebula near the limbus of the right; the globes were

shrunken, quadrate, and soft; the anterior chamber was filled by the thickened, discoloured, and vascular iris; the pupillary margin indrawn and the pupil filled with organised lymph. This condition, Dr. Posey believes, was the result of emboli consequent upon the intense chronic hypertrophic rhinitis which had induced uveitis and atrophy of both globes.

Dr. B. A. Randall had studied several cases of blindness from optic neuritis caused by nasal disease, but the form of metastatic blindness, as exhibited by Dr. Posey's patient, was rare. He had operated by iridectomy in a similar condition of absolute blindness, closure of the pupil, low tension, and nystagmus, and the patient had recovered vision in one eye, sufficient to enable him to earn his living as a travelling canvasser. The iris, while friable, was sufficiently dense and tough to permit of a clear coloboma and detachment of the excluded pupil.

Dr. G. C. Harlan reported a *Case of Transient Retinal Arterial Pulse induced by the Application of Homatropine* in a negro man, 72 years of age, whose general health had been unusually good, with the exception of an occasional attack of subacute articular rheumatism. The left eye was disabled by the results of an attack of kerato-iritis. In the right eye V. $\doteq \frac{15}{100}$. There was no decided increase of tension, the pupil was responsive, the anterior chamber normal, the cornea sensitive, and there was only moderate peripheral contraction of the field. Homatropine was applied for ophthalmoscopic examination and retinoscopy. The disc was decidedly pale but without excavation, the vessels were slightly narrowed, and there was a very distinct pulsation of the lower branch of the retinal artery. At the next visit, and in a subsequent examination several weeks later, the pulse had disappeared and there had been some improvement of vision under the use of strychnia.

Dr. Harlan referred to a case that he had reported to the American Ophthalmological Society in 1890. The patient was 66 years of age. An energetic pulse of all the larger arteries on the disc was several times produced by homatropine and stopped by eserine. There was only

a very shallow cup and no bending of the vessels at its margin. Tension was doubtful and the field and anterior chamber were normal. This patient, some months after the report of his case, had a well-marked attack of glaucoma of which the transient pulse may be considered the first decided symptom. Dr. Harlan suggested that, as the effects of homatropine are easily neutralised by eserine, its application might be a permissible means of diagnosis in some doubtful cases. In a recent case of failing vision with decided cupping, but no other positive symptom of glaucoma, in which iridectomy of one eye had been worse than useless, the absence of a pulse after the use of homatropine had been considered a useful indication.

Dr. Edward Jackson thought the use of homatropine for the diagnosis of glaucoma sometimes justifiable, provided the patient assented. He had employed it for this purpose. He referred to a case where duboisin had been used as a mydriatic and had produced the retinal pulse and glaucoma. Iridectomy was done and the patient retained her vision for sixteen years. In the second eye eserine had been resorted to, and later, after glaucoma developed, medical and operative treatment were of no avail and vision was entirely lost.

Dr. G. E. de Schweinitz described some *Cases of Central Amblyopia and their Significance*, dwelling particularly upon the early stages of the toxic variety of this affection, when the scotoma rapidly disappears under treatment and visual acuity is restored to the normal. He suggested, in accordance with recent observations, that the lesion at this stage of the disease is probably a vascular disturbance in the macular tract—a lesion which antedates either inflammation or degeneration of the involved tissues. One case of unilateral central scotoma was shown in which no cause for the visual defect except the abuse of tobacco and alcohol could be found, but he agreed with Dr. Berry and others, that in spite of the absence of other etiological factors, these unilateral cases should be regarded as of doubtful toxic origin. Unilateral scotomata as representatives of the stigmata of hysteria were also recorded,

and the author was again in accord with Dr. Berry, that although this etiology had been suggested, they were often the forerunners of serious nervous disease. Finally, cases of scotoma occurring in the so-called "neglected eyes" were presented, one of which had vitiated the visual results of a perfect cataract extraction.

Dr. Edward Jackson read a paper on *The Technique of Needle Operations on the Lens and Capsule*, and called attention to certain points with reference to these operations. In some cases discission of the lens differed essentially from division of the capsule. To avoid the escape of lens matter into the anterior chamber the opening in the capsule should be small, and to get such a small opening and yet freely divide the lens, it was necessary to bring the opening in the capsule close to the opening in the cornea, by letting the aqueous escape. But to divide a membrane after cataract extraction the longest possible sweep of the cutting edge was best, and this was obtained by entering the needle through the limbus. This point of entrance also reduced to a minimum the risk of infection, because the wound in vascular tissue closed promptly after the operation. In dividing a capsule it was often best to carry the incision through those portions to which posterior synechiæ were attached, thus freeing the iris from an irritating drag upon it. He also called attention to the difficulty of securing a crucial incision and the greater certainty of success in making a T-shaped incision, which would allow sufficient gaping to give the required clear pupil.

# A MNEMONIC FOR OCULAR PARALYSES.

By Ernest E. Maddox. Bournemouth.

Mnemonics afford considerable aid to beginners, and to those who cannot confidently trust themselves to mental processes in the conditions of haste under which diagnoses have frequently to be made.

They are not, of course, intended to replace an intelligent understanding of the *modus operandi* of the ocular muscles, but only to supplement it, their value being proportionate to the impossibility of making a mistake in their use, and, it may be added, of forgetting the mnemonic! They should, in short, be both simple and safe.

The many excellent mnemonics which already exist, since they are based on the hypothesis that every paralysis is typical, are more or less unsafe in the large proportion of atypical cases which are met with.

This is not to say that they have not their own proper value *after* the diagnosis, to confirm it in all its details, if the case prove typical; but for the primary diagnosis a mnemonic should depend only on those signs which are constant and reliable, and should not depend, therefore, too much on the horizontal element of the diplopia (except in the case of the internal and external recti), nor yet on the torsion of the false image.

For example, it is well known that in paralysis of any one of the obliques, a pre-existing latent divergence (exophoria) may be set free (*i.e.*, cease to be


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latent and become manifest), in the diplopic area of the field, and may so complicate the case as to convert the typical "homonymous" diplopia into "crossed" diplopia.

A similar complication may occur, though less likely to do so, in paralyses of the superior and inferior recti, where there is a possibility of a pre-existing latent convergence (esophoria) converting the typical "crossed" diplopia into "homonymous."

Further, with regard to the *torsion* of the false image, Mauthner called particular attention to the untrustworthiness of the answers given by patients on this point, though it is true that by using the glass rod the difficulty is sometimes lessened, the tilting of a long streak of light being pretty easily observed.

In addition to this, I imagine that cases occur in which, however accurate the patient may be in describing the false image, the paralytic torsion is (at least in parts of the field) overborne by a greater pre-existing latent torsion exerted in the opposite sense, so as to completely mask or falsify the paralytic torsion, and thus make the nature of the torsion become a misleading index.

In confirmation of this, it may be mentioned that on incidentally testing a refraction case, I found as much as 10° of latent outward torsion with distant vision, which increased to 20° with vision for twenty inches. Such cases must be rather rare, but should any one so circumstanced subsequently develop paralysis of an outward torsion muscle (inf. rectus or inf. oblique), the latent condition would probably reverse the torsion of the false image. The only way to detect the reversal would be to study the torsion in all parts of the field.

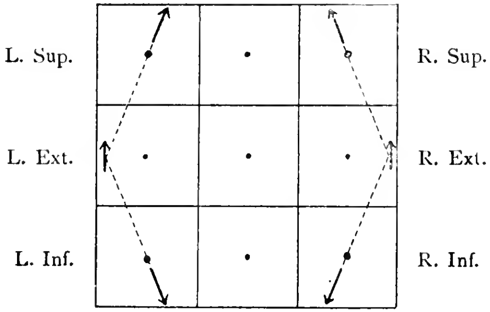
In another patient (complicated, however, with incomitant hyperphoria, so that it was not so remark-

able) I also found 10° of latent torsion in distant vision.

Both of these patients were men, and both had a persistent tendency to headache, though it would be rash to assume too confidently that the latter depended on their ocular equilibrium.

All these considerations accentuate the value of Mauthner's excellent advice to pay attention only to the vertical element of the diplopia in paralysis of the torsion-producing muscles, at least for the rough primary diagnosis.

The proposed mnemonic consists in so naming the areas of the field of diplopia that the area of greatest *vertical* diplopia shall be the namesake either of the affected muscle, or of its true associate in the other eye. Happily, no arbitrary nomenclature of the areas is required, since their own proper names afford just what is wanted. See figure.




Mnemonic device showing the nature of the diplopia for each muscle. Also the "namesake" description of the areas. The dots in the centre of each area are the true images, and the arrows the false images. Thus the arrow in the Right Superior area shows the displacement and torsion of the false image in par. of the Right Superior Rectus or its associate the Left Inferior Oblique; in the Left Inferior area, of the Left Inferior Rectus or Right Inferior Oblique, and so on.

There is therefore no effort of memory, each area having its natural name from the patient's point of

view. Thus the *right superior* area is that which lies in the upper part of the field, to the patient's right. *Maximum vertical diplopia* found in this situation means paralysis of the namesake muscle, the *right superior* rectus, or else of its true associate in the other eye, the *left inferior* oblique. It is easy to settle between these two by finding to which eye the false image belongs.

"True associates" can always be borne in mind by remembering that their names are the most contrary possible. For example, *left inferior oblique* is in every term opposite to *right superior rectus*.

In short, having found the area of greatest *vertical* diplopia, the paralysed muscle is *either the same named rectus or its cross named oblique*.

As regards the less important torsional and horizontal elements of the diplopia, the same diagrammatic mnemonic device makes them quite easy to remember, and if once constructed by the reader, is easily imprinted on the memory. The dotted "lines of direction," drawn from the false images of the external recti to the centres of the corner areas, need only be

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There are two plans of recording ocular paralyses at present, in one of which the surgeon imagines himself the patient and looks at the motor field from the patient's point of view. The figure represents this plan. In the other plan, the surgeon chooses the easier task of imagining himself where he really is, so as to look at the motor field from his own side. It is as though a grating, or a window frame were suspended in the air between the patient and himself, the areas being named by the patient but looked at by the surgeon. These two plans correspond precisely to the two methods in vogue for recording the lenses in a trial frame.

The inconvenience often experienced in translating one mode into another may be overcome by remembering that one mode of entry (1) looked at in a looking-glass, or (2) transferred by copying-ink to a sheet of paper, or (3) pricked through to the back of the sheet, yields the other mode of entry. The "namesake" mnemonic just described answers in both modes of entry, since, in each, it is the patient who names the areas. But the diagram would need reversing for the second plan, so as to look at it, as it were, from the other side.

produced beyond those centres to show the sense of the torsion, and also the direction of the horizontal displacement of the false image in the diagnostic area of each muscle. Thus, in the right superior area, the diagram represents the false image of the right superior rectus, and by the same arrow, that of its true associate the left inferior oblique, both as regards the levo-torsion and the levo-duction which are common to both. Of course, the torsion is greater and the vertical separation less in the case of the obliques than in that of the recti, but the diagram is not meant to be used thus quantitatively, but only qualitatively. To use it more quantitatively we should have to imagine the lines of directions to be wires, and that we could lay hold of the false images of the external recti and draw them further apart ; we should thus alter the false images in the corner squares to resemble those of the obliques. On the contrary, were we to press the false images of the external recti more together, we should make the lines of direction become almost vertical, and then the false images in the corner squares would more truly represent those of the superior and inferior recti, the vertical displacement being increased, and the torsional lessened.

FELIX LAGRANGE (Bordeaux). **Metastatic Carcinoma of the Choroid.** *Annales d'Oculistique, January*, 1898.

In medical literature only some twenty cases of metastatic carcinoma of the choroid have been recorded, but the written accounts of the cases have been so careful and so complete that we have a very fairly exact description of the disease.

Perles was the first, in 1872, to describe a case; in it both choroids were affected secondarily to a cancer of the pleura. Ten years later Hirschberg published one, but though the lesion was diagnosed clinically, no microscopic examination was obtained in either of these. Of the principal facts regarding these and the other cases on record Lagrange gives a brief *résumé* in tabular form, and then describes his own case, which was that of a woman aged 48, who came to him complaining of defective sight. In other matters the history of both patient and her family was good, but three years previously a malignant tumour had been discovered in the left breast and removed from it. The growth recurred and a second operation had been performed, in the course of which the axilla was cleared out. A gland which had been omitted in the former operation was removed at a later period, as it was showing signs of increase. Examination of the breast tumour revealed indubitable carcinoma. The patient did not consult Lagrange until in the glaucoma stage of tumour of the choroid, but he obtained a history of gradual loss of vision, which was complete before any symptoms of tension came on, a state of affairs highly suggestive of neoplasm. The conjunctiva was slightly injected; the tension increased somewhat; the pupil semi-dilated and irregular; the cornea healthy and normally sensitive; at its external portion the iris showed a nodular neoplasm, projecting but slightly, reddish in colour. Careful inspection showed that the neoplasm appeared to form part of the iris tissue, causing it to be increased in thickness four or five-fold;

the angle of the anterior chamber was completely annulled in all the area corresponding to the growth, that is to say about one-third of the circumference. The lens remained transparent but there was complete detachment of the retina, and the vitreous was slightly turbid. There was no staphyloma, no immobility of the globe, no exophthalmos. The diagnosis was quite obvious, and although cure could not be looked for, the eye was enucleated for the relief of the glaucoma pains, and the patient recovered well, but died three months later from secondary tumour of the spine and from cachexia.

A careful account of the naked eye and microscopic appearances of the tumour is given, from which we extract the following: The growth was confined to the uveal tract of the globe, the retina on the one hand and the sclerotic on the other being unaffected; the tumour of the iris was entirely distinct from that of the choroid, and it could be clearly made out that it grew from the stroma of the iris and made its way forwards only, obliterating the angle of the anterior chamber over the whole outer third of the circumference. Sections of the choroidal tumour made just at its margin showed typical carcinoma invading the whole thickness of the vascular coat, with here and there a considerable alveolus filled with large epithelial cells, somewhat cubical in form and with a large nucleus. Between these spaces one could see the normal vessels of the choroid. The large alveoli were in the suprachoroidea; tubes blocked with cellular elements and looking like vessels were to be found in the layers of the large and medium-sized vessels. Some of these tubes may have consisted of blood vessels blocked with epithelial elements, but all could not be so; this was the case, however, with certain vessels especially where the anterior ciliary trunks penetrated the sclerotic. This coat was intact, but certain of its vessels showed cellular emboli. Sections made at the thickest portion of the tumour displayed more alveoli, the contents of some of which had destroyed the walls and were eating their way into the choroid which was infiltrated with epithelial cells and

was becoming quite broken down and fragmentary. Here and there were necrosed portions and interstitial hæmorrhages. Sections of the tumour of the iris showed a very similar state of affairs; the tissue was infiltrated everywhere with epithelial cells. The only portions of the iris still recognisable were the anterior and posterior basal membranes.

The author proceeds to discuss the question of the pathological anatomy and physiology of metastatic carcinoma under several headings.

(1) The structure of the tumour. The general aspect of the neoplasm is that of an alveolar stratum filled with agglomerations of polyhedral cells, irregularly hexagonal in form, each containing a large nucleus. Gayet in his case described glandular tubes lined by a single layer of epithelial cells, and consequently regarded it as an adenoma, but it is evident that in so doing he was in error. Kamocki too described a glandular tumour of the choroid and supposed that a portion of the lacrymal tissue had found its way into the interior of the eye during the process of development, but it may more probably have had its origin in the glands of aqueous humour. It is particularly interesting to note the glandular appearance in Gayet's case, for it suggests the possibility that the secondary tumours taking their origin from the glands of the stomach may have retained a peculiar tendency to that form of growth when the cells became implanted in the choroid. In a large proportion of the cases hæmorrhages have been present, especially in the interior of the spaces, and the blood has been enclosed in two or three layers of cancer cells. Has the necrosis of tissue in these spaces resulted from the hæmorrhages, then? Schultze thinks so, but Lagrange thinks that the cells may also necrose from being crowded together and choked in the unyielding tissue of the lamellæ of the choroid. The choroidal pigment is more abundant where the parts are not degenerated, but largely absorbed where the choroid is destroyed. In parts the choroid has been thickened rather by increase in its connective tissue than by proliferation of the cancer

cells, as Uhthoff has observed. In a few instances the tumour has not confined itself to the choroid but has spread back along the optic nerve, and Uhthoff in one case found a retro-bulbar tumour outside the nerve but completely enclosing it, and the nerve and its sheaths where they were in the grasp of the tumour much degenerated. On two or three occasions this retro-bulbar growth of tumour continuous with the intra-ocular neoplasm through a perforation in the sclera has been observed, and the nerve has been found invaded even up to the chiasma. Propagation to the retina is much more rare, indeed it has been seen only once.

(2) The seat of the tumour. The left eye has been much more frequently affected than the right, a fact attributed (as the similar fact relating to cerebral embolism also is) to the particular arrangement of the carotid arteries. It is almost always the case also that the metastatic growth begins in the posterior portion of the choroid, in the region supplied by the short ciliary arteries, and to the temporal side, probably because the macular area is more fully supplied with blood than the nasal portions.

(3) The form of the tumour is usually that of a plaque diffusing itself thus most readily through the tissue of the choroid from which it springs. It arises first in the neighbourhood of the macula, and thence spreads in ever widening circles of diffusion, with thickening of the choroidal structure at one part, and at another thinning.

(4) The course of the disease is always very rapid; in a few weeks vision is gone and the detachment of retina is complete. In a very considerable proportion of the cases (7 out of 20) both eyes have been affected; in 8 of the remainder the left eye was that attacked. Death, it seems, is to be expected within a year from the first onset, the invasion of the eye by cancer appearing to indicate that the whole organism is sinking under the power of the cachexia. During the period of its growth in the eye, the tumour sets up metastases in the neck, vertebral column and principal viscera; paraplegia occurs and severe neuralgia.

(5) Relation of the metastatic to the original affection. It is nearly always from a cancer of the breast that the eye becomes affected; out of 20 cases, the mamma was the region first attacked in 16, the sites of the other four were: the stomach (1), the thyroid (1), and the lung (2). Lagrange suggests that the cause of this marked relationship may exist in similarity of tissue of choroid and of the structure surrounding the acini of the gland, and in the manner in which these atypical epithelial cells behave in the two situations.

To the discussion of the symptoms and diagnosis of the lesion he devotes also a few pages. The development of the tumour is rapid, but there is neither pain, inflammation, nor other acute sign; only a constantly increasing detachment of retina, entailing loss of vision. With the ophthalmoscope greyish or yellowish patches in the choroid have been seen in the earlier stages in the immediate neighbourhood of the disc. There is not in metastatic carcinoma the same tendency that exists in sarcoma, to the production of glaucoma; the tension is rather apt to sink, on account probably of the increasing enfeeblement of nutrition of the vitreous tumour.

Into the differential diagnosis between cancer and other lesions with which it is possible to confound it, Lagrange enters at what seems very unnecessary length; the points become obvious from what has been said above, and from the previous existence of cancer in the patient.

W. G. S.

**Geo. C. Harlan** (Philadelphia). **Trophic Keratitis, with a Case occuring in Caisson Disease.** *Trans. American Ophthalmol. Soc.*, 1897.

Harlan, in a paper prepared for the American Ophthalmological Society, but not read before its meeting, reports the case of a man, aged 29, who had worked in a caisson under an atmospheric pressure rising from 18 to 30 pounds, and who, after six weeks, suffered from giddiness, debility, loss of appetite, nausea, and finally frequent vomiting, and occasional numbness of the right side. He was obliged to stop work, and the right eye at the same time began to be irritable and painful.

When he presented himself six weeks later there was a superficial ulcer of the cornea about 3 mm. in diameter, near the outer border, with irregular, ill-defined margins and a greyish infiltrated surface, and the whole cornea was steamy. There was a dense pericorneal zone, but no corneal vessels. Some slender posterior synechiæ showed a moderate iritis. The fundus could not be seen. There was anæsthesia, almost complete, of the cornea and conjunctiva, and of all parts of the face supplied by the ophthalmic and superior maxillary branches of the fifth nerve. There was also loss of taste on the right side of the tongue. No other sensory and no motor paralysis was present unless perhaps a slight weakness of the masseter, which was not, however, positively determined. The temperature on the right side of the mouth was three-fifths of a degree higher than on the left.

Four days later the area of the ulcer had increased and a small hypopyon appeared, but this lasted only a few days, and then there was a decided improvement in the condition of the cornea. Later a well defined opacity occupied the position of the ulcer, and the whole cornea had become vascular. There was little or no improvement in sensation. His general condition having improved, ankyloblepharon was produced for the protection of the still insensitive cornea.

It can hardly be claimed that exposure to irritants was

a prime cause of corneal disease in this case, as keratitis persisted for months after the cornea was carefully protected, though it is possible that if this had not been done the disease might have proved more destructive. Then, too, the iris was involved in the early stages before the corneal affection had reached its height.

The cerebral and spinal lesions of caisson disease are explained on the theory that the brain and spinal cord, being contained in bony cavities, are less exposed to the effects of increased atmospheric pressure, and that consequently blood is driven into them from the periphery and soft tissues. However this may be, there is no doubt that intracranial lesions do occur, and they might readily involve the Gasserian ganglion or the fifth nerve or its central nuclei.

The corneal lesions which follow section of the fifth nerve, or its paralysis from other cause, were formerly attributed to the loss of the trophic influence of this nerve. But since Snellen and Buttner reported that in their experiments on rabbits these lesions did not occur if the eye was protected, such lesions have been quite generally attributed, at least in the text-books, to the loss of sensation of the cornea, and its consequent injury by external irritants. Numberless clinical cases have been recorded, which would prove this contention most satisfactorily, if there were not others which, if less numerous, are equally positive on the other side of the question, and can be better explained by recourse to the older theory.

The cornea will sometimes slough, if exposed, though perfectly sensitive, but it by no means always does so when insensitive. Among many examples of the resistance of a sensitive cornea to exposure is mentioned the case of a patient whose eyes had been completely exposed for six years owing to the entire destruction of the lid by a burn, but the cornea remained perfectly clear. As for the insensitive cornea, in one case a haziness of about a fourth of the cornea, which occurred during the acute stage of an affection of the fifth nerve, probably gouty, was permanent; but the rest of the cornea remained clear and

bright for years, though sensation never returned to it. In absolute glaucoma, the insensitive cornea never sloughs or presents anything like the picture of neuro-paralytic keratitis. It may even remain clear. Proofs are not wanting that the sensibility of the cornea and the state of its nutrition are not necessarily associated.

Instances of loss of corneal sensation without inflammation are not very infrequent; and so-called neuro-paralytic keratitis without loss of sensation has been observed. So, also, we may have typical neuro-paralytic sloughing of the cornea without exposure. In one case of a progressive lesion, the cornea, which had remained clear under prolonged exposure, began to suffer at the very time when it was protected by paralysis of the levator palpebræ.

Norris has reported a case of neuro-paralytic ophthalmia from intracranial disease in which the insensitive cornea sloughed, though it had been carefully protected. Such cases are comparatively rare, but the positive proof that they offer that the cornea may suffer in connection with lesions of the fifth nerve, under conditions that exclude the mere loss of sensation as a cause, cannot be ignored. No doubt in some cases simple exposure, either with or without loss of sensation, particularly when combined with pressure, as frequently occurs in exophthalmic goitre, is competent to induce destructive keratitis. But it is equally certain that in other cases inflammation of the cornea, and even of the deeper structures of the eye, occurs as an evident result of lesions of the fifth nerve, though exposure to external irritants can be positively excluded as a cause. It is well known that the cornea is not always involved alone, but even in the earlier stages of the disease the iris is often found to be affected; and in some experimental cases hypopyon has occurred, while the cornea remained sound and clear.

Instead of the sloughing or ulcerative keratitis usually met with in this form of ophthalmia, an increase of nutritive action, resulting in vascular turgescence and hypertrophy, may occur. This is illustrated by the case of a woman, aged 44, who complained of a painful affec-

tion of the left eye, from which she had suffered for a year. The sight was gone and the patient had intense and constant pain in the eyeball, brow, and side of the head. There was complete loss of sensation in the cornea and in all the other parts supplied by the fifth nerve, except a just perceptible sensitiveness of the ocular conjunctiva. There was no other paralysis and no indication of herpes. The palpebral conjunctiva was enormously thickened and the bulbar conjunctiva engorged, while the cornea presented a dense pannus. The other eye was sound and the patient's general health was good.

Harlan thinks with Panas that neuro-paralytic keratitis has its point of departure in an alteration of the Gasserian ganglion, or of the nuclei of the fifth pair; and that this is perhaps about as far as we can go confidently in the present state of our knowledge, leaving it still undecided whether this alteration is of a paralytic or an irritative character, and whether its effects are produced through the medium of sensitive, vaso-motor, or special trophic fibres.

E. J.

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ELSCHNIG (Vienna). Cilioretinal Vessels. *Graefe's Archiv.*, *xliv.*, 1.

The vascular supply of the optic nerve head and retina has an importance quite out of proportion to the area involved, and variations from the normal arrangement of the vessels are of corresponding interest. Cilioretinal vessels are by far the most common form of such variations, occurring in not less than 7 per cent. of all eyes; but while they are quite familiar as ophthalmoscopic objects we have still only scanty information as to the origin and course of these vessels before they become visible on the fundus. The reason for this obviously is

that the condition is not one which would in itself lead to the pathological examination of the eye, while in eyes which have been excised for other causes it rarely happens that the exact course of the vessels has been observed during life. Dr. Elschnig has, however, given special attention to this point, and by carefully recording and sketching all the cases of cilioretinal vessels which he has met with during a number of years he has been able in a certain proportion of them to compare the results of the ophthalmological and pathological examinations. The facts obtained from eleven eyes, containing thirteen cilioretinal vessels, were briefly as follows:

The thirteen vessels were all derived from the circle of short ciliary arteries surrounding the optic nerve. They could be divided into three groups according to the directness of their connection with those vessels.

*Group I.* consisted of primary branches of the ciliary arteries which pierced the sclera obliquely, without sending any branch to the choroid, to enter the intra-scleral portion of the optic nerve (1 case), or its intra-choroidal portion (2 cases).

*Group II.* contained those offsets of the ciliary arteries which primarily entered the choroid and there divided into two or more branches, of which one passed on into the retina as a cilioretinal artery, while the others ramified in the choroid. The cilioretinal was the main continuation of the vessel in four cases, a comparatively small branch in one case.

The cilioretinal vessels of *Group III.* were branches of choroidal vessels which themselves were offshoots of the second or more remote degree from the ciliary arteries. Of these there were five examples.

As a rule the visible course of the vessel gives no certain indication of its mode of origin; it is only when it is seen to arise within the area of a crescent or conus that its direct origin from a ciliary and not from a choroidal vessel can be asserted.

As regards the course of the cilioretinal arteries in the retina, in the great majority of cases they emerge from

the outer lateral segment of the disc, if small, running direct to the macula, if of larger size more or less completely taking the place of one of the temporal arteries. It is only rarely that they occupy other positions, except in eyes which present some other evidence of irregular development, such as coloboma, unusual cupping of the disc, or abnormally situated conus.

All the cilioretinal vessels of which the author was able to obtain specimens, were arteries; as far as his experience goes cilioretinal veins are of comparatively rare occurrence; he has only seen four with the ophthalmoscope in the course of ten years during which his attention has been directed to the subject.

Finally, it is important to note that these vessels, though exceptional in their mode of origin, form no real exception to the mode of blood-supply of the retina; that is to say, that like the normal retinal arteries they are *end-arteries*, their obliteration leads to the same phenomena as the obliteration of a branch of the central artery, the existence of one of them in a case of embolism of the central artery is of exactly the same significance as the escape of a branch of the latter, and under no circumstances can they contribute to the formation of a collateral circulation.

W. G. Laws.

**St. Bernheimer (Vienna). On the Relation of the Ciliary Ganglion to the Pupil-reaction.** *Arch. f. Ophthal., Bd. xliv., Abth.* 3.

In several diseases of the nervous system, notably *tabes dorsalis*, an early and persistent symptom frequently met with is loss of the reflex pupillary contraction. In such cases, examination of the oculo-motor (third) nucleus has generally given negative results, although the kind of paralysis and its continued limitation to a portion of the nerve would seem to indicate with certainty that the lesion was central. This and other facts have led to the suggestion that there is a second centre for the contraction of the pupil, between the oculo-motor nucleus and the short ciliary nerves. If this be so the ciliary ganglion is possibly the seat of this centre.

The opinions of histologists and physiologists as to the functions of the ciliary ganglion and as to its place in the nervous system vary considerably. The author discusses these varying views, and without going into details the chief hypothesis may be here recorded. According to Schwalbe, Antonelli, and others, the ciliary ganglion belongs exclusively to the oculo-motor nerve. His, Remak, and others, consider that the ganglion is part of the trigeminus, while v. Kolliker holds that it contains only multipolar cells and is part of the sympathetic system.

The author's experiments were undertaken with the object of obtaining evidence as to the exact nature of the ciliary ganglion. They were as follows:—complete exenteration of one eye of a monkey was performed; the second eye being untouched. Ten days later the animal was killed, both ciliary ganglia removed and carefully preserved and examined. In a second monkey the cornea of one eye was destroyed by the galvano-cautery down to, but not including, Descemet's membrane. No lesion of the iris was produced or developed subsequently. The animal was killed on the eleventh day, and both ciliary ganglia removed and subjected to careful microscopic examination.

In the first experiment (in which all the ciliary nerves inside one eyeball were destroyed), the ganglion on the side operated on showed well marked degeneration; many of its cells were shrunken, the nuclei displaced to the margin, and in many no nucleus or nucleolus was visible. No normal cells were discovered in any of the series of sections which the authors prepared. The ganglion of the other orbit appeared in all respects healthy.

In the second experiment, in which the lesion was limited to the cornea, the ganglion of the eye operated on exhibited very noticeable alterations. In a large number of the sections the cells were either quite normal, or so nearly so that it was quite impossible to say positively that any pathological condition was present. In about a third of the sections, however, there were many cells which were very degenerate; in some these cells were in groups, in others mingled with healthy cells. In the other ganglion of this animal no signs of degeneration were present.

St. Bernheimer holds that in the ciliary ganglion of the apes fibres arise which are distributed, not only to the iris and ciliary body, but also to the cornea. If we assume, as he thinks we may, that the same anatomical conditions obtain in man, then the hypothesis that a primary lesion of the ganglion would induce an isolated paralysis of the pupillary reaction becomes extremely improbable. Such a lesion should also lead to alteration in the cornea; and this association has not hitherto been recorded in the cases of reflex immobility of the pupil.

So far as the author's experimental results go, they support the view that the ciliary ganglion is sensory; they are most directly in opposition to the theory that it is a part of the sympathetic system. He gives drawings of the microscopic appearances of the ganglia examined.

J. B. L.

# OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

MR. HENRY EALES, Vice-President, in the Chair.

THURSDAY, JANUARY 27, 1898.

*Epithelial Xerosis of the Conjunctiva.*—Mr. Sydney Stephenson made a communication upon epithelial xerosis of the conjunctiva, which he said was not uncommon in England, since among 6,209 children he had found no fewer than 1·87 per cent. affected. At particular places the examples of xerosis ranged from 0·66 per cent. to 9·47 per cent. After describing the appearances and bacteriology of the affection he passed on to consider its relationship to night blindness, which he regarded as something more than merely accidental. He pointed out that xerosis in the absence of hemeralopia was supposed to give rise to no symptoms beyond such as were presented by the conjunctiva. He had found, however, changes in the visual field—namely, (*a*) a reduction in size and a transposition of the red and green fields, and (*b*) a slight contraction in the limits of the field for white. The former was constant, the latter not always present. The retinal reflexes in these cases appeared also to be exaggerated. Mr. Stephenson concluded that every eye with epithelial xerosis was in a state of torpor retinæ. In discussing the causes of xerosis he laid stress on two factors—first, lowered nutrition, and secondly, dazzling by bright light. Most of his patients suffered from internal otorrhœa, hypertrophied tonsils, peripheral vascular opacities of the cornea, relapsing pustular eruptions of the face or scalp, or other signs of "scrofula" or tubercle. Hæmoglobin, according to Mr. Stephenson, was always reduced in amount, averaging in his cases of xerosis 65 per cent. of the normal, as tested by Gowers's hæmoglobinometer. As the conjunctival changes disappeared the proportion of hæmoglobin rose, but never to normal. This led him to inquire whether among children it was always below par. In conjunction with Mr. C. G. Burton he examined 164

healthy children, with the result that it was found to vary from 65 per cent. to 95 per cent. and to average 76·62 per cent. of the normal. Mr. Stephenson further claimed that in xerosis the red blood-cells were sometimes reduced in number. As to treatment, he strongly recommended iron, preferably in the form of Blaud's pill. Mr. Stephenson quoted a number of cases and illustrated his paper by cultivations and microscopical preparations of the xerosis bacillus.

Mr. Arnold Lawson spoke of the morphological resemblance which the bacillus of xerosis bore to the Klebs-Löffler bacillus of diphtheria, though the manner and conditions of growth varied widely. The remarkable thing about the xerosis bacillus was its inertness, though it was so plentiful and swamped all the other bacilli.

Mr. Breuer thought that constitutional ailment and not the xerosis was the cause of the symptoms in this disease. In one case in which a *post-mortem* examination was made cirrhosis of the liver was found, bile acids dissolved the visual purple, and there may have been some relationship between the night blindness and the altered function of the liver.

Dr. Eyre had attempted to raise the pathogenicity of the xerosis bacillus by varying the conditions of growth and by injecting toxin to impair the resistance of the subject, but all his results had been negative and the bacillus remained inert.

Brigade-Surgeon Lieutenant-Colonel Drake-Brockman had seen a great deal of this affection in the East and was glad to find his own observations in most respects confirmed. It was especially frequent in badly nourished children or those affected with tubercle or syphilis or intestinal parasites; it occurred among adults during famines. He found iron preceded by the removal of intestinal parasites the best treatment.

*On the Function of the Rods of the Human Retina.*—Mr. A. Breuer read a paper on the Function of the Rods of the Human Retina, and dealt with the new theory of Kries

regarding the function of the human visual apparatus. He described experiments of his own which tended to confirm the statement that the function of the rods differed from that of the cones. By means of experiments after adaptation of the eye for dark he demonstrated that the sensibility of the periphery of the retina for feebly illuminated objects was very much greater than that of the macula. Under these conditions (dark adaptation) the macular part of the visual field was represented by an absolute scotoma, the exact extent of which was found to vary according to the intensity of the illumination employed. The weaker the illumination and the longer the adaptation of the eye for the dark the greater this area became. Other experiments made by Kries illustrated the same fact. He observed, for instance, that colour equations found by direct fixation and in a strong light no longer held good with peripheral vision under feeble illumination. These changes, moreover, were most marked when employing lights of short wave length. All these points were modified examples of the well-known phenomenon of Purkinje, who showed first, that when blue and red objects of equal luminosity were selected, the blue gained considerably in brightness as the eye was longer adapted for the dark. This difference, however, as Kries had shown, did not take place in small fields which fell entirely within the macula. Hence it was clear that the functions of the periphery of the retina and the macula were distinct. Other authorities attributed these differences to the presence of the yellow pigment in the macula.

Mr. Breuer detailed an experiment which, he thought, proved that this assertion was not supportable. Further, Mr. Breuer in a paper published in the *Zeitschrift für Physiologie und Psychologie der Sinnesorgane*, Band xiv., measured quantitatively the amount of absorption affected by the macular pigment for spectral lights of different wave lengths and found it quite inadequate to account for the differences between peripheral and central vision. These and many other observations made it highly probable that the theory of Kries was correct—namely, that a division of function

seemed to exist between the apparatus connected with rods and cones respectively. According to him the latter, the cones, formed a trichromatic apparatus—that is, one capable of distinguishing the spectral colours and requiring for its exercise higher intensities of light resulting in greater definiteness and clearness of perception. The rods, on the other hand, constituted an apparatus adapted for exercise of function at far lower intensities of light, with the natural drawback of being able only to distinguish between light and dark, and not between colours. Generally speaking, it was the cones that were exercised in strong light and the rods in weak. Briefly summed up, this special kind of vision, or the function of the rods, is characterised by (1) its inability to distinguish colours; (2) a very pronounced sensibility for weakly illuminated objects; (3) a preference for rays of medium and short wave length; and (4) its total absence at the macula.

*The Localisation of Foreign Bodies in the Eye and Orbit by Means of the Roentgen Rays.*—Dr. McKenzie Davidson made a few introductory remarks as to the Method of Localisation of Foreign Bodies by the Roentgen Rays. He demonstrated the special application of the method for the detection, localisation, and estimation of size of foreign bodies in the eyeball and orbit. The patient was seated upright and his head fixed in a rectangular rest. The photographic plate was placed against the temple of the affected side behind cross wires. A lead wire was made to touch the edge of the lower eyelid opposite a known point on the eye, and the patient fixed his eye on a distant object during the exposures. These were made in the same way as for other parts of the body and the interpretation of the skiagraphs was carried out by the use of the "cross-thread localiser."

Mr. Treacher Collins then gave a description of four cases in which this method had been applied. In none of them could the presence of a foreign body be certainly determined from the clinical appearances. In two of the cases the chip of steel was subsequently withdrawn by the

introduction of an electro-magnet in the direction in which it had been ascertained to lie. The size of one of these bits of steel was practically the same as had been estimated previously to its removal. In another case, the eye being quiet and two and a half months having elapsed since the injury, operative procedure was not thought justifiable. In the remaining case, which was the first they had dealt with before they had obtained sufficient experience of the method, the foreign body was found to lie in the orbit when they thought it was lodged in the eyeball. Mr. Collins also mentioned three cases where the presence of a foreign body in the eye was suspected in which they had by means of the X-rays been able to assure themselves none was there. In one of their patients, in whose case a large number of exposures had been made, some loss of hair occurred a month afterwards from the temple which was nearest to the tube.

*Card Specimens.*—The following were shown: Mr. G. Hartridge: (1) Foreign Body lodged in the Eyeball; (2) Rupture of the Choroid, with extensive Retinal Pigmentation, the result of a severe concussion of the globe. Mr. Lawford: Newly Developed Blood-vessels in the Optic Disc. Mr. Rolston: Case of Keratitis. Mr. Poulett Wells: The result of Scraping Calcareous Film of the Cornea.

## AMERICAN MEDICAL ASSOCIATION—SECTION OF OPHTHALMOLOGY.

ANNUAL MEETING HELD AT PHILADELPHIA, 1897.

GEORGE E. DE SCHWEINITZ, of Philadelphia, Chairman.

*Glaucoma following Traumatism, unassociated with Dislocation of the Lens.*—The chairman in his address reported a case of this kind, and discussed this form of glaucoma in general. A man, aged 46, suffered from a contusion of the left eyeball, with slight laceration of the conjunctiva but without dislocation of the lens ; between the seventh and twenty-second day after the injury optic neuritis developed, with arterial pulsation and slight increase of the intraocular tension, marked depreciation of central vision and contraction of the field of vision. At first there was improvement under eserine and a general subsidence of the neuritis, the improvement lasting about two weeks. At the end of three weeks there was renewed depreciation of vision with formation of a cup in the nerve head. After this gradual increase in depth of the cup and the atrophy of the nerve occurred until (treatment having been entirely disregarded) vision was reduced to *nil*. Throughout the entire course of the affection there was a moderate, increased tension (+ 1) and quick arterial pulse, which persisted even when the atrophy was complete. Nearly three months after the injury there developed a ciliary staphyloma up and out.

Primary irregularity of the pupil suggested lateral dislocation of the lens, but as the pupil was in a few days restored to its normal circular form and reaction (although the latter was somewhat sluggish) it might be regarded as an example of partial traumatic mydriasis.

De Schweinitz believed that the blow produced congestion and swelling of the ciliary structures, closing the outlet of the anterior chamber. He concluded that in cases of traumatic glaucoma, setting aside for the moment those which cause the typical secondary variety of the

disease, the lesions, so far as we may judge from microscopic examinations, are similar to those which we find in the primary variety of the affection. These cases further indicate the necessity for keeping under observation patients who have suffered from blows on the eye, even when all external manifestations of the injury have passed away, because they may develop, as in the above case and in many others in literature, a glaucoma which will result in blindness, if an opportunity is not afforded to treat the patient, either because he does not present himself in time, or having presented himself in time, he neglects advice and disappears from observation until it is too late to remedy the evil.

*The Roentgen Rays in Ophthalmic Surgery.*—Dr. H. F. Hansell (Philadelphia) discussed the possibility of their perception by blind eyes, but as the result of a number of trials it was found in cases of opacity of the media such as leucomatous cornea, capsular and lenticular cataract, that no improvement whatever could be observed either in the disease or in the ability of the patients to see more clearly through the fluoroscope than without it. In a case of nearly absolute central scotoma, due to a large patch of central retino-choroiditis, repeated exposure to the rays as they were emitted from the tube gave the same negative result. The findings in cases of atrophy of the optic nerve were equally discouraging. From these trials it was concluded that as a means of treatment of diseased conditions causing blindness, the rays were of no value. The only exception was a case in which the exposure had the unexpected effect of soothing pain and reducing inflammation, but whether this happy result was simply a coincidence or a real or psychic manifestation could not be asserted.

No case of injury to the tissues of the eyes from exposure to the rays had been encountered. He reported two cases in which they had served to demonstrate the presence of bits of steel in the vitreous.

Dr. W. M. Sweet (Philadelphia) explained his method

of locating foreign bodies within the eyeball by means of indicators (see vol. xvi., page 253); and reported a series of experiments to ascertain whether very small metallic bodies in the eye could be localised by means of the Roentgen rays, to what extent the bones of the orbit interfered with the passage of the rays, the best character of tube, and the best point at which to place the tube. He was able to detect a piece of wire 3 mm. in diameter and pieces of iron 1 mm. long and less than that in thickness.

The experiments seemed to leave no doubt as to the great superiority of the small focus point tube as compared with that of the large focus. The negatives also showed in how small a degree the bones of the orbit obstruct the rays. The thickest portion of the external orbital wall is where the frontal and malar bones join, forming the external angle of the orbit. In the deeper portion of the orbital wall the bones are relatively thin. Notwithstanding the difference in the thickness of the bones, the shadows cast by the steel wires are perfectly distinct throughout their entire length. In making radiographs of the eye the best results are secured when the tube is run at high vacuum, so that there shall be great penetration of the ball and the muscular and bony structures. In this way the shadow of the denser metallic body is more clearly shown upon the plate.

The time of exposure was varied from two to six minutes, four minutes appearing to give perfectly satisfactory results, although in one instance an exposure of thirty-five seconds gave a negative of excellent detail.

Both X-ray plates and rapid landscape plates were used in the experiments, and so far as could be seen from the negatives, the landscape plates gave as good detail and as sharp an outline of the foreign bodies as those made with specially prepared X-ray plates, besides which the landscape plates required much less time in developing and fixing.

The tube was placed at least thirteen inches away, from which distance the rays could be regarded as practically parallel.

Dr. C. F. Clark (Columbus, Ohio) pointed out that for the detection of very small bits of metal it was necessary to bring the plate as close to the eye as possible. He had held it next to the nose. He had also seen a case in which dermatitis and falling out of the hair had followed exposure to the rays. The hair returned after a few months, but was white.

*Removal of Steel by the Electro-magnet of Haab.*—Dr. J. E. Weeks (New York) reported two cases of removal of pieces of steel from the vitreous with preservation of vision by a large electro-magnet as proposed by Haab.

In a third case where the magnet failed to bring out the piece of steel it was found on enucleation that the chip had passed out through the sclera and lay to the temporal side of the optic nerve. The strength of the magnet was such that with a current of ten amperes at a distance of 10 mm. it attracted one gram of iron with the force of 93 grams, the attractive force increasing rapidly with the increased tension of the current.

Weeks' experience in the use of the large magnet has forced him to recognise its superiority over small magnets in all cases of recent injury where the wound is situated in the anterior segment of the globe, and where it can be approached by the tip of the magnet in a right line. With slight enlargement of the original wound, the foreign body, if it be steel or iron, can be made to re-traverse the path made by it, and the removal can be effected without introducing an instrument into the interior of the eye, and without making a second opening into another part of the eye.

In cases where the foreign body has passed into the vitreous and remained for more than a week, he doubts the value of the large magnet, but in cases where the lens is the resting place of the foreign body, as in Haab's first case, it is of value. For diagnostic purposes it will aid materially.

Dr. J. A. Lippincott (Pittsburg) had constructed some years ago a large portable magnet which would sustain

fourteen or fifteen pounds from its point, with which he had removed five foreign bodies from various portions of the eye, using the ordinary street current. Such magnets are of use in diagnosis, not only to demonstrate the presence of the foreign body in the eye, but also its approximate position.

*Shot Grain Wounds of the Eye.*—Dr. L. H. Taylor (Wilkesbarre) reported three cases of such injury, in which, with conservative treatment, including rest, the steady application of cold during the period of early reaction, atropine and careful cleansing, the eyes had been preserved with useful vision. He concluded that shot grain wounds of the eye are less dangerous than wounds of similar severity from many other causes. That in general an eye wounded by shot grains, unless the wound be one of unusual severity, should not be immediately enucleated, but should be treated conservatively under careful observation.

*When to Enucleate for Injury.*—Dr. J. M. Foster (Denver) urged that we should give the operation serious thought in penetrating wounds of the ciliary region, but not do an operation for every ciliary wound. Enucleate, regardless of the situation of the wound, in cases where there is marked inflammation of the injured eye and photophobia in the other; also when panophthalmitis is threatened. The time to enucleate is as soon as possible after deciding it is necessary.

Dr. J. C. Dunlavy (Sioux City) regarded evisceration as better than enucleation, when the globe was filled with pus, although if a foreign body had penetrated the globe and could not be found by evisceration removal should be practised.

*Implantation of a Glass Ball in the Orbit, and Mules' Operation.*—Dr. L. Webster Fox (Philadelphia) referred to the objectionable sinking of the artificial eye after enucleation, to the deficient movements and retained secretions, and later muco-purulent discharge, which adhered to the margin of the lids and the surface of the artificial eye. Having

used the plan of Frost and Lang of placing an artificial globe in Tenon's capsule immediately after enucleation, he had also resorted to it in cases where enucleation had previously been performed.

An incision was made through the conjunctiva and tissues of the orbit in the horizontal direction, slightly smaller than the diameter of the glass ball to be inserted; for instance, if the glass ball were one centimetre, the cut would be two millimetres less. The upper lip of the conjunctiva was raised, and with sharp-pointed, curved scissors the conjunctiva, with such connective tissue as lay close to it, was dissected off in all directions round the incision, making a pouch into which the glass ball would fit. On account of the vascularity of the parts, considerable bleeding followed this dissection, but it was easily controlled by pressure. After the bleeding stopped the glass ball was inserted into the *cul-de-sac* with the injector and the edges of the conjunctiva were brought together by five or six stitches. He had performed fourteen operations; in five cases the stitches broke and the ball came out.

The Mules' operation he considered as safe as enucleation. He had performed it in eighty-two cases, and so far had been able to trace no serious results. In two cases the glass ball came out after two months. Eight cases did not heal by first intention and the artificial globe came out before the patients left the hospital.

Dr. A. Pick (Brockton, Mass.), seeking for an elastic unbreakable body for an artificial vitreous after evisceration, had tried one experiment on the eye of a rabbit with a soft rubber ball, which he thought would prove satisfactory.

Dr. F. Allport (Chicago) had done Mules' operation several times in the last few months with uniformly favourable results. He controlled hæmorrhage with very hot bichloride tampons. He thought the subsequent escape of the glass globe was often due to the use of an insufficient number of sutures. He employed as many as seven or eight. He had found that the artificial eyes

now on the market, which had been manufactured with a view to filling out a hollow orbital cavity, were not of good shape for use after the Mules' operation, which demands a rather broad flattish shell, now hard to get hold of.

Dr. Risley thought the Mules' operation to be commended for prudently selected cases. It probably should never be allowed to supplant excision of the globe in an extensive group of cases. His method of performing the operation is to detach the conjunctiva for 5 mm. back from the cornea. A Beer's knife is then inserted in the horizontal meridian about 5 mm. from the cornea, and the counter puncture made at a corresponding point on the opposite side of the ball, the knife entering behind the iris, the complete incision simply including the root of the iris above. The upper edge of the flap is then grasped with the forceps, and a corresponding incision made below with the scissors. Much time and annoyance are then saved by grasping, as gently as possible, with broad forceps, the ciliary body and carefully detaching the entire uvea with the flat handle of a scalpel. Then grasp it at its attachment in the region of the optic nerve, when the posterior scleral vessels may be torn away and the entire contents of the ball removed with comparatively little difficulty.

*Bacteria in the Normal Conjunctiva.*—Dr. R. L. Randolph (Baltimore), experimenting on the normal conjunctiva, found that in 100 cases bacteria were present in eighty-seven. Cultures made after the use of aseptic irrigation showed living bacteria in a slightly smaller proportion of cases, and flooding the conjunctiva with a 1 to 5,000 sublimate solution, or even dipping the platinum loop for five minutes in such a solution, did not prevent a luxurious growth of bacteria. Aseptic and antiseptic methods led to practically the same results. By neither was sterility of the conjunctiva obtained.

Dr. H. Gifford (Omaha) agreed that it was practically impossible to sterilise the conjunctival sac.

Dr. J. E. Weeks thought it would be unfortunate to give up attempts to render the conjunctival sac as clear of bacteria as possible. Pathogenic bacteria may be present and yet create no disturbance unless they be present in large quantities. We can by relatively harmless methods lessen their number. He used the antiseptic solutions.

*Methods of Sterilising Ophthalmic Instruments and Solutions.*—Dr. E. A. de Schweinitz (Washington) had devised a flask for preserving solutions free from contamination. The tube through which the solution was expelled was made with a bend which acted as a trap and prevented the entrance of dust. Before using the solution the tip could be sterilised by heat. The first few drops of solution escaping were thrown away; the entrance of bacteria was most completely prevented by allowing sufficient antiseptic solution to fill the trap, to be drawn into the tube every time it was used. To keep ophthalmic solutions sterile he had employed trikresol in the proportions of 1 to 1,000. Such solutions loosely corked had remained sterile three years. By recent experiment he had found that a solution of formaldehyde 1 to 5,000 became sterile in ten minutes, and a solution of 1 to 1,000 became sterile in twenty-four hours after contamination with pyogenic bacteria.

For the sterilisation of instruments, the soaking for ten minutes in a 1 to 1,000 solution of formaldehyde, or for thirty-five minutes in a 1 to 2,000 solution rendered them sterile. But probably the best method was to expose the instrument to formaldehyde gas in a closed box. If the odour were strong when the door was opened one could be thoroughly satisfied that the instruments were sterile. The gas does not injuriously affect them.

*After Treatment of Cataract.*—Dr. J. A. White (Richmond, Va.), was of the opinion that the eye would do best with the least possible interference during the ten days following operation. The best way to keep it at rest was by a well-adapted dressing of sterilised gauze and absorbent cotton, and by confining the patient to bed.

Dr. C. A. Wood (Chicago) felt that if the operation was

perfect the dressing was of little or no importance. If, however, the operation failed in any important particular the question arose what dressing was most likely to assist repair and prevent infection. He preferred the layer of absorbent cotton or wood wool applied to sterilised gauze, and the whole cut as one piece of uniform size to cover the orbital margin and brows. These were kept in place by three strips of plaster for each eye, arranged in the form of a triangle. To prevent external injury he found one of the best shields to be a *papier maché* half mask.

Dr. Miles Standish (Boston) in a case of profuse suppuration of the lacrymal sac had, after extraction of the lens, filled the conjunctiva with iodoform. The eye remained dry until at the end of eight or nine days the bandage was removed and the iodoform discontinued. But at the end of twenty-four hours he had an infection of the entire edge of the wound. The actual cautery was used; iodoform was again begun and kept up for two weeks. No recurrence of the pus showed itself, and the result was good.

*Cataract Statistics.*—Dr. H. Knapp (New York) read a paper based upon 400 cases of extraction not previously reported. Most statistics refer only to uncomplicated cases, yet this does not make them comparable with one another, since operators differ as to what they consider complicated. Such statistics should be supplemented by a special report on all excluded cases.

Taking acuteness of sight as the standard of success or failure excludes certain cases of extraction of the lens from necessarily blind eyes, which may require greater skill than the ordinary extraction. Such cases might be spoken of as operative successes.

Of the 400 cases 57 were considered complicated, including cases of diabetes, albuminuria, gout, rheumatism, insanity, chronic bronchitis, traumatism, dacryocystitis, excessive myopia, fluid vitreous, choroiditis, corneal opacity, glaucoma, optic atrophy, nystagmus, dislocated lens and previous syphilis. Among these there were eight

failures. Three, or half of the cases of dacryocystitis, were lost by suppuration. In 55 of the 400 cases iridectomy was done, 15 of them requiring subsequent operations. Of the whole 400, 160 required after operations, 153 being division of the capsule. Among 343 simple extractions, prolapse of the iris occurred in 26 cases, mostly during the first night, rarely later than the third day. The eyes were inspected daily and the prolapse at once excised. The ultimate result was good in all but one case in which the prolapse came from chronic cough. The visual results of the whole series were $\frac{20}{200}$ to $\frac{20}{20}$, 359 cases; $\frac{1}{200}$ to $\frac{18}{200}$, 29 cases. Failures, 12 cases. Glaucoma followed extraction in about 1 per cent. of all cases, and may occur at any time after the operation, even as late as thirty years.

*Prolapse of Iris after simple Extraction.*—Dr. L. F. Loye (Philadelphia) reported four cases of prolapse of the iris among twenty simple extractions. By correspondence he had found most ophthalmic surgeons advised that the prolapse be cut off and the edges of the iris reduced as soon after it occurred as possible. This plan he had followed with uniformly good results.

*Glaucoma.*—Dr. D. S. Reynolds (Louisville) believed it unwise to perform iridectomy during a paroxysm of chronic glaucoma. A saline followed by sodium salicylate and pilocarpin subdued pain, and put the eye in better condition for iridectomy. He was convinced that eyes were sacrificed in the hasty performance of iridectomy, and his experience with sclerotomy, both anterior and posterior, left doubt as to the value of either form of the operation.

*Secondary Glaucoma.*—Dr. S. D. Risley (Philadelphia) thought it probable that under this title might be quite correctly classified all cases of inflammatory glaucoma whether acute or chronic. There would then remain a comparatively small, ill defined group of cases of a non-inflammatory type, to be designated simple or primary. It

results from widely diverse pathological processes such as hæmorrhagic retinitis, gouty disease of the uvea, traumatism, plastic uveitis, &c. He reported and discussed two illustrative cases.

One of a coloured man, aged 32, who had plastic iridocyclitis, occlusion of the pupils and secondary glaucoma, and recovered after iridectomy.

The other, a man who had neuritis, progressive disease of the retina and choroid at the posterior pole of the eye, with only a single thread-like synechia, degeneration of the vitreous, deposits on the posterior surface of the cornea and later increased tension.

*Angio-Myxo-Sarcoma of the Orbit.* — Dr. S. C. Ayres (Cincinnati) reported a case occurring in a woman aged 64, the tumour having been noticed eighteen years previously at the upper outer angle of the orbit. The eye was pushed down and forward so that the posterior portion of the globe was almost on a line with the bridge of the nose. The motility of the ocular muscles was unimpaired. There was optic atrophy but perception of light. The tumour was removed without sacrificing the globe, but it was decided to remove the eye also; there had been no return of the growth after more than one year. It measured 30 by 30 by 20 mm. The microscope showed a large number of dilated blood vessels with thin walls. The remaining tissue was a combination of sarcomatous cells with a considerable admixture of fibrous connective tissue, and a hyaline tissue made up of branching cells and a hyaline or mucoid intercellular substance.

*(To be continued.)*

# PHLYCTENULAR CONJUNCTIVITIS: SOME MATTERS OF DETAIL.

By Surgeon Capt. H. Herbert, F.R.C.S.

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Working in Bombay the following features have struck me in connection with phlyctenular conjunctivitis, as not included in the ordinary descriptions; some of these features probably apply in Europe also, others are to a large extent, perhaps, peculiar to this country :—

(1) *Association with Chronic Conjunctivitis.*—A large proportion of our phlyctenular cases show the signs of old chronic conjunctivitis. To get a rough idea of relative proportion in this and other matters, I lately tabulated one hundred consecutive cases of phlyctenular conjunctivitis at the C. J. Ophthalmic Hospital, Bombay. Twenty-one of these patients had chronic granular lids; eleven others had clear signs of chronic simple conjunctivitis in both eyes (thickening, papillary roughness and injection of palpebral conjunctiva), with phlyctenes only in one eye; in other cases there were chronic inflammatory changes, but they might have been due to repeated attacks of phlyctenular mischief. Roughly, then, in about a third of the hundred cases the phlyctenes occurred in membranes already the seat of chronic inflammation. This is not surprising if the phlyctenes are to be regarded as the result of local invasions of cocci, as in the vesicles of impetigo and acute vesicular eczema; for the general inflammation will not only ensure the presence of

organisms, but also perhaps render the epithelium more liable to damage or detachment, and so permit the entry of the organisms into the tissues.

(2) *The Eczematous Type.*—In six of the hundred patients the phlyctenes were associated with a general acute or subacute conjunctivitis, which was evidently primary, the eruptions being secondary and perhaps more or less accidental complications. The inflammation was acute catarrhal in three, follicular in one, and subacute granular in two cases; in four of the six cases the general inflammation affected both eyes, though the phlyctenular lesions were limited to one eye. In one solitary case the phlyctenes were of the "miliary" type—minute, multiple and confined to the limbus; in none of the other cases was there more than one phlyctene in the one conjunctiva; the seat of the lesion was in one instance on the upper lid, in the others on the limbus. This group of cases may well be classed as of the *eczematous type*, the eruption occurring on an actively inflamed base, in contradistinction to the more ordinary or *impetiginous* variety, where any recent access of inflammation is secondary and proportionate to the eruption. In the latter group, when the foci are very numerous the secondary general inflammation may of course be very marked, and render the cases difficult to classify.

(3) *Phlyctenes on the Lids.*—It appears to be generally held that phlyctenes are limited to the bulbar conjunctiva (including the corneal epithelium); but they undoubtedly occur at times, at least in Bombay, on the membrane covering the tarsi. The essential part of a phlyctene is the collection of inflammatory cells which constitutes the translucent greyish elevation, the lower layers of which are still seen as a thin milky film covering the subsequent ulcer until healing begins. On the ocular conjunctiva this is found situated on a slight local inflammatory swelling, with injection. On

the lids we find the same greyish or milky white infiltration, which rapidly melts down into an ulcer; and just as on the eyeball, the ulcer, and even the infiltration before it becomes an ulcer, stain well with fluorescin. The only difference lies in the surrounding inflammatory reaction; on the eyeball it tends to be localised, on the lids it is diffuse. The palpebral eruption is found on a uniformly thickened, reddened and usually roughened membrane. In eleven of the hundred cases which I tabulated, there were phlyctenes on the palpebral conjunctiva; in three of these cases there was epithelial xerosis (see below). At one time I collected notes of over fifty patients with palpebral phlyctenes. In most cases, but not quite in all, they are associated with phlyctenes on the bulbar conjunctivæ; they are more commonly multiple than single, and their favourite seat is just within the lid-border; they tend to spread out in a line here. They are more common on the upper lid than on the lower. Occasionally two or three join together into an irregular conglomerate infiltration. Their characteristic acute course, and nearly invariable association with similar lesions on the bulbar membrane, are sufficient for diagnosis.

(4) *Xerosis Ulcers.*—The severer grades of epithelial xerosis described by me in the *Indian Medical Gazette* of April, 1897, have been especially common in Bombay since the late famine in the Presidency. These degenerate and chronically inflamed conjunctivæ are frequently the seat of phlyctenular eruption. In some cases the lesions have much the ordinary appearance, but more commonly they assume characteristic features. They are especially prone to affect the palpebral conjunctiva;[1] indeed they are more often

[1] Possibly on account of this connection palpebral phlyctenes are more common in this country than in Europe.

found on the lids than on the eyeball. The inflammatory reaction associated with them is commonly very mild, while, on the other hand, there is more destruction of tissue than usual. They grow to a much larger size than ordinary, and very rapidly become superficial ulcers, rather by a process of necrosis than of molecular disintegration. These ulcers present at first an opaque white or cream-coloured surface, instead of the common translucent milky film; and they often leave thin scars on healing. In five of the hundred tabulated cases the conjunctivæ were xerotic; in three of these five patients the phlyctenular ulcers were large and typical of xerosis.

(5) *Age of Patients.*—The only other point I have to notice is the large proportion of adults affected with phlyctenular conjunctivitis in India. Judging from the hundred collected cases, more than a third of our patients are over twenty years of age, and a few scattered cases are over fifty.

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**WILFRED HARRIS (London). Hemianopia, with especial Reference to its Transient Varieties.** *Brain, vol. xx., No.* 79, 1897.

This is a long and careful article written as a thesis for the degree of M.D. of Cambridge. It was originally intended to deal with several unusual cases of transient hemianopia, associated with unilateral convulsions. Such cases, the author states, have not hitherto been described, and in his opinion they go far to prove a theory of cortical representation of the macula, and that the innervation of the macular region in the retina is on the same plan as that of the rest of the retina. For various reasons the author extended the scope of his paper, and deals with the subject under the following heads:—

(1) Bitemporal hemianopia; (2) bi-nasal hemianopia; (3) hemianopia in hysteria; (4) homonymous hemianopia; (5) quadrantic hemianopia; (6) colour hemianopia; (7) hemianopic hallucinations; (8) hemianopia beginning with blindness; (9) central incomplete hemianopia; (10) double hemianopia; (11) cortical representation of the macula; (12) transient hemianopia.

Although there is much that is of importance and interest throughout the paper, we propose to limit this abstract to the subjects of the last three sections—double hemianopia, the cortical representation of the macula, and transient hemianopia.

*Double Hemianopia.*—This condition almost always begins with sudden complete blindness, but in some cases loss of one-half the visual field has occurred, and has been followed by sudden complete blindness. Numerous cases are now on record in which, after both modes of onset, recovery of a small central area of vision has occurred generally with considerable diminution of visual acuity.

The fields in these instances resemble the pin-point fields in hysteria, but a characteristic loss of orientation, and consequent difficulty in finding their way about is mentioned in cases described by Foerster, Groenouw and Vorster. This symptom, usually absent in the functional cases, serves to distinguish the two varieties. In the hysterical cases there is no doubt that the half vision centres do perceive, and hence visual impressions produce reflex effect, though higher psychical influences inhibit the sense perceptions. In the cases of true double hemianopia there is loss of perception in the half vision centres.

*Cortical representation of the Macula.*—Cases of double hemianopia with return or persistence of central vision, argue strongly in favour of the theory of a cortical representation of the macula. There are two theories with regard to the representation of this region in the cortex.

(1) That the whole of each macula is represented in each half vision centre, and that there is a special decussation of the macular fibres at the chiasma. According to this hypothesis the dividing line between the seeing and

blind fields in all cases of hemianopia, whether due to cortical or tract lesions, should pass round the fixation point, which is then included in the seeing half. Instances in which the line appears to pass close to or through the fixation point are accounted for by individual variations in the nervous supply of the macula.

(2) Foerster's theory that the nervous supply of the macula is invariably arranged on the same plan as the rest of the retina, and that each half of it is innervated from the corresponding half vision centre in the cuneus. Further, that in each half vision centre the corresponding halves of each macula are represented in a special area which is more richly supplied with vessels, or, at all events, more resistant to disease than the rest of the visual centre. According to this theory, in a total destruction of one half vision centre, as by hæmorrhage, or in the destruction of one optic tract, the dividing line in the fields of vision would pass through the fixation point, but in a lesion such as softening from embolism, &c., the special area, owing to numerous anastomoses in its blood supply, escapes, and the dividing line would then skirt the fixation point, leaving it in the seeing half of the field.

The author holds that this theory, which will account for either position of the dividing line (*i.e.*, through the fixation point or skirting it) is worthy of greater credence.

Cases of double hemianopia with retention of a small central area of vision strongly support the suggestion that in each half vision centre the area representing the macula is less liable to suffer than the rest of the cortical centre. Harris believes that the study of cases of transient hemianopia affords "complete proof that the macula is innervated on the same plan as the rest of the retina," and that no special decussation of the macular fibres occurs.

In nine instances of transient hemianopia each lasting several hours, which were examined (by the writer) during the stage of complete loss of half vision, the dividing line passed accurately through the line of fixation. In such cases, as the hemianopia disappears in twenty-four hours

or thereabout, the loss of function of the half vision centre must be due to exhaustion and not to any gross lesion, and therefore the centre for the macula may suffer equally with the rest of the cortical visual centre. In all these cases recovery takes place from the centre of the field towards the periphery; an additional piece of evidence, the author thinks, that the cortical centre for central vision has greater recuperative powers than that for peripheral vision.

On the other hand, in no case of persistent hemianopia, examined by the author, has the dividing line passed through the fixation point, though in some cases it lies extremely close to it. This apparent discrepancy between transient and persistent hemianopia may be accounted for in one of two ways; (1) in the persistent variety the cortical centre for the macula may either have escaped destruction, or have regained some of its functions; or (2) a new fixation point in the retina close to the fovea centralis may have been developed by education.

*Transient Hemianopia.*—After referring to transient hemianopia as a phenomenon of migraine, the author descibes four cases recently under his observation. These four patients had between them eleven attacks of transient hemianopia, each attack lasting for several hours and generally accompanying unilateral convulsions, but in one case preceding a typical epileptic fit.

The first case was that of a man, in whom left homonymous hemianopia came on, after some giddiness, nausea, headache, and numbness and tingling of both hands and of the left thigh. The pupils and ocular movements were normal except that the eyes were turned to the left very slowly.

Some three hours later he had a typical epileptic fit. Two and a half hours later the hemianopia was still complete. Next morning, about eighteen hours after the fit, the hemianopia was clearing up and by the evening the fields were of full size. The hemianopia was complete for about twelve hours, and about the same time elapsed before it disappeared. Eleven days later he had incomplete left hemianopia lasting for the greater part of a day, but not accompanied by any convulsive attack.

The man gave a history of several similar attacks of dimness of sight during the eighteen months before he came under observation.

*Case* 2 was that of a woman, aged 53, who when admitted to hospital presented all the symptoms and signs of myxœdema. For ten years she had been liable to fits occurring about every three months, but of late more frequently. Between October, 1896, and January, 1897, she had five fits, all left-sided; consciousness was only partially lost; the twitchings of the left hand and foot lasted half an hour and were followed by complete paralysis of the left arm and weakness of the left leg. There was complete left hemianopia, the dividing line passing exactly through the fixation point. The hemianopia remained complete for twenty-eight hours and then gradually cleared up, the fields becoming normal. Several similar fits occurred, each accompanied by left homonymous hemianopia. She died of pneumonia soon after leaving the hospital. The record of the *post-mortem* examination of the brain is, in brief, as follows :—

The brain, though soft in places, showed no naked eye signs of disease. On dissection, after hardening, a small cyst was found in the lower part of the right quadrate lobule. It was about a quarter of an inch in diameter, evidently the result of an old hæmorrhage. There was no organised cyst wall, but numerous degenerated white fibres were shown by Marchi's staining. No other lesion could be found.

The author's explanation of the case is this: The first fit ten years ago was due to the occurrence of the hæmorrhage, and the recurrent, left-sided attacks were due to instability of the surrounding grey matter, set up by the irritation of the softened and necrosed white matter beneath. The proximity of the lesion to the right cuneus and optic radiations will account for the left hemianopia which always accompanied the fits, and which probably preceded the motor convulsion, and was due to early loss of function in the half vision centre.

*Case* 3 was that of a woman, aged 40, admitted to

hospital in March, 1896. She gave a history of headache and numbness of the left hand for five years, and during the last eighteen months had had three left-sided convulsive attacks. The attack in which the hemianopia was observed began with numbness in the left hand, followed by twitching of the left arm and leg and one and a half hours later by general convulsions with loss of consciousness and cyanosis. When examined, after recovery of consciousness, there was complete left homonymous hemianopia. Taste and smell were unaffected, but hearing in the left ear was reduced to $\frac{1}{40}$. Four hours later the hemianopia was clearing up, and by the next morning the visual fields were of full size. In a subsequent attack, without loss of consciousness or general convulsion, there was a left-sided visual spectrum, followed by visual hallucinations in the left half of the field. The symptoms in this case point to a lesion in the motor tract on the right side, probably in the cortical centre for the arm, the discharge spreading thence to the half vision centre on the same side, paralysing its functions and producing left hemianopia.

*Case* 4 occurred in a man aged 54, in whom there was permanent *partial* right hemianopia, which during three convulsive attacks while in hospital became *complete;* the completeness was transient, lasting about twenty-four hours and the field of vision then gradually improving to its previous condition. The first seizure resembled ordinary epilipsy, the two succeeding attacks were typical Jacksonian convulsions without loss of consciousness; on each occasion the hemianopia was complete, and of longer duration than usual.

This patient died of cerebral hæmorrhage, and at the autopsy there was found, in addition, a patch of softening in the second temporo-sphenoidal convolution on the left side, about two inches in length, and not quite reaching to the angular gyrus. The brain had not been cut at the time the author published his paper.

These four patients were under observation in the National Hospital, Queen Square.

Harris terminates his paper by a series of conclusions

which refer to all the varieties of hemianopia, and not merely to the transient kind. These we give almost exactly in his own words :—

(1) Hemianopia, rarely bi-nasal, more commonly lateral and left-sided, with constriction of the remaining half fields, may occur as a temporary phenomenon in hysteria.

(2) Hemianopia due to a vascular lesion of the cuneus of sudden onset, may begin with marked loss of sight, amounting sometimes to complete amaurosis, and due probably to inhibition of the remaining half vision centre.

(3) The cortical half vision centres are not subdivided into centres for light, form, and colour respectively; hemiachromatopia may be due to a lesion anywhere in the visual path between the chiasma and the cortex.

(4) Quadrantic hemianopia, though strongly suggestive of a cortical lesion, may sometimes be due to a lesion in the internal capsule.

(5) The macular region of the retina is invariably supplied with nerve fibres on the same plan as the rest of the retina, *i.e.*, each half of it from the corresponding half of the brain. In all cases of absolute transient hemianopia the dividing line between the seeing and the blind halves passes through the fixation point.

(6) The cortical centre for the macular region in each cuneus is less liable to complete destruction, and recovers earlier than the rest of the half vision centre.

(7) Cases of persistent hemianopia in which the dividing line passes to one side of the fixation point, leaving it in the seeing half, are to be accounted for, either (*a*) by the escape or partial recovery of the cortical centre for the macula, or (*b*) by the acquirement by education of a new fixation point in the retina.

(8) Hemianopic visual spectra of low elaboration, such as red and green lights, or the varieties of scintillating scotoma, are caused by a discharge in the half vision centre in the cuneus.

(9) Complex visual phenomena of hemianopic types, such as faces, animals, etc., are elaborated in a higher

visual centre, which is possibly the angular gyrus; their occurrence in the half field only is due to reflex irritation from a lesion generally in or near the cuneus, but which may be in the optic radiations or optic tract.

(10) Double hemianopia does not necessarily cause permanent amaurosis; in many cases the return of a small area of central vision indicates the escape or recovery of the cortical centre for the macula in the cuneus, on each side.

(11) The hemianopia in migraine is due to an epileptic discharge in the half vision centre of one side.

(12) In many cases an epileptic discharge may originate in, or near, the half vision centre on one side, in some cases producing only temporary hemianopia, in others spreading and producing a typical epileptic fit, and again in others giving rise to unilateral convulsions without loss of consciousness.

(13) Transient hemianopia in such attacks may last for twenty-four hours or longer, and may be due to vascular softening adjacent to but not involving the visual centre or path.

(14) Transient hemianopia is rare in ordinary Jacksonian epilepsy, and is not liable to occur unless the half vision centre be (*a*) already slightly damaged or (*b*) hyper-sensitive and prone to spontaneous discharge, as in migraine.

(15) Such transient hemianopia not infrequently accompanies unilateral convulsions in general paralysis and may possibly occur in uræmia.

A very full table of references forms a valuable appendix to this paper.

J. B. L.

**CHARLES STEDMAN BULL (New York). Lesions of the Retinal Vessels, Retina and Optic Nerve, associated with Gout.** *Transactions of the Fourth Congress of American Physicians and Surgeons*, 1897.

Bull's paper is based upon the study of fifteen cases, five of which he has previously reported. It includes three autopsies. He directs especial attention to the following lesions:—

Changes in the walls of the blood vessels of the retina, choroid and optic nerve, including arteries, capillaries, and veins. Retinitis of a peculiarly localised character, confined to the posterior zone of the fundus, with or without hæmorrhages in the retina and vitreous, and characterised by a peculiar yellowish exudation occurring in clearly defined patches. Optic neuritis, generally with, but sometimes without an accompanying retinitis.

The subjective symptoms consist of a deterioration of the vision, at first for small-sized type, but later for all objects at any distance, and a certain degree of photophobia, most marked for artificial light. The ophthalmoscope shows more or less marked blurring of the outlines of the optic discs, resembling the first stage of papillitis, but without the œdematous swelling. The retinal arteries are diminished in calibre, in some places the lumen being reduced to the merest thread, and requiring the closest examination to see the minute blood column that still exists.

The white lines along the vessels, both arteries and veins, are broad and distinct, and extend from the centre of the papilla well out towards the periphery of the fundus. Occasionally the veins in places seem dilated like a fusiform aneurism, the vessel on both sides of the dilatation being reduced in calibre.

Yellowish-white patches of exudation, at first brilliant, but subsequently becoming dull, of varying size and shape, are seen mainly grouped about the region of the macula and disc, but with no systematic arrangement. These patches of exudation are entirely in the inner layers of the

retina, as proved by the microscope. If hæmorrhages are present, they are linear or flame-shaped in character, occur close to the vessels, both arteries and veins, and while mainly grouped around the posterior pole of the eye, are sometimes scattered all over the fundus.

If opacities of the vitreous are present, they are of the floating variety, are of small and of varying shape, and may be either the result of previous hæmorrhages, or an evidence of co-existing choroiditis. The ophthalmoscopic picture in these cases is that of general retinal angio-sclerosis, with the addition of the glistening patches of exudation in the retina.

The patients had all shown signs of extensive degeneration of the walls of the blood vessels throughout the body, notably in the temporal and radial arteries. The urine was usually of moderately high specific gravity, ranging from 1020 to 1026. It was loaded with uric acid and phosphatic acid crystals, and occasionally was found to contain a little albumen, but never any sugar or casts.

Sections made of the retina, choroid and optic nerve showed very extensive angio-sclerosis. The adventitia and media were very decidedly thickened, but the main increase was in the intima, which in many cases was so marked as almost to obliterate the lumen. The proliferation in the adventitia was largely granular, while the thickening in the intima was mainly due to hyaline deposit. Numerous fusiform aneurysmal dilatations were found in the arteries, almost always at the point of origin of a branch, and on the distal side of these dilatations the calibre of the vessel was markedly narrowed. There were a number of hæmorrhages always close to the vessels. The nerve fibres on the papilla and in the retina were markedly varicose, and the spaces between them were filled by fine granular matter. In the retina the nerve fibre layer was thickened by infiltration of a mass of fine granules, aggregated in heaps, with occasional distinct cells filled with the same granular contents. These masses of fine granules extended through all the layers of the retina except that of the rods and cones, most of them,

however, being in the nerve fibre layer. Sections of the optic nerve at various points as far back as the chiasma showed the same changes in the walls of the blood vessels, and more or less marked varicosity of the nerve fibres, and small masses of fine granules.

The choroidal blood vessels showed the same angio-sclerosis changes. There were no patches of exudation found anywhere in the choroid such as existed in the retina.

The following are Bull's conclusions :—

The changes in the fundus are always bilateral, though rarely symmetrical in the two eyes. The lesion may begin simultaneously in the two eyes, but this is by no means always the case.

The degenerative changes in the walls of the blood-vessels, both arteries and veins, are at first very minute and often overlooked. They must be carefully searched for, as they begin in the intima.

The general angio-sclerosis and the patchy exudation in the retina cause marked impairment of central vision, but little impairment of peripheral vision, and the disease never ends in blindness.

The loss of central vision is always progressive up to a certain point. Improvement of the vision, after the retinal disease is established, cannot be expected, though in favourable cases the existing vision may be maintained.

Hæmorrhages into the retina are rare except in the comparatively early stages of the disease. When the vessels lose their elasticity by reason of the increase in the thickness of their walls, due to the deposits, they at the same time become stronger and more rigid, and hæmorrhages are no longer to be feared.

The most marked feature in the ophthalmoscopic picture is the development of the angio-sclerosis in the vessels of the retina. This condition is confirmed by the microscope, and is seen to extend to the vessels of the optic nerve and choroid.

Another almost equally marked symptom is the peculiar yellowish granular exudation in the retina, located by the

ophthalmoscope round the posterior pole of the eye, and generally leaving the macula intact until late in the course of the disease. This exudation is shown by the microscope to be mainly in the nerve-fibre layer, though found in all the layers except that of the rods and cones.

The changes in the optic nerves seem generally to be intraocular, but have been traced occasionally for some distance behind the eyeball.

E. J.

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JOHAN HJORT (Christiania). The "Open Treatment" in Eye Operations. *Centralbl. f. Augenh., May*, 1897, *p.* 138. *November*, 1897, *p.* 329.
One Hundred Cataract Extractions with "Open Wound Treatment." *Ibidem, February*, 1898, *p.* 33.

The "open" treatment of surgical wounds is old enough, and its results do not appear to have given satisfaction to the profession, but we have now to decide whether the treatment which appears to have failed in general surgery may not be useful in ophthalmic surgery.

The conditions are not perfectly similar. Under ordinary circumstances a corneal wound is exposed to the washing of its surface by the tears, and the rubbing of the eye-lids. The action of the tears is held by some observers to be germicidal, and the tendency of the normal action of winking is undoubtedly to remove any such foreign bodies as micro-organisms if they happen to be present. It is also well known that many eyes do not bear bandages well. They get red, and secrete mucus and even pus in a short time. The above considerations seem to have induced Hjort to try the experiment of leaving the eyes

open after all operations on the globe, and he reports himself thoroughly satisfied with his results. He adopts the precaution of complete epilation of the cilia of both eyelids before operating. Hjort's experience leads him to the conclusion that wound infection does not come from instruments or hands or the atmosphere, but from germs in the conjunctiva or about the cilia; or it is hæmatogenous.

The advantages of what we may call free drainage or douching are shown also by those cases which most operators have met with; cases where the corneal wound has remained open for a long time, and where the course of healing has been perfectly aseptic.

Hjort gives in his first paper the results of "open wound treatment" in 112 cases of eye operations where the globe was opened,—cataract, iridectomy, etc., and states that he himself and his assistants and nurses are all agreed that the results are more satisfactory than they were when the conventional bandage was employed.

In the second paper Hjort protests against any such agent as "Schutzpapier" being employed in open wound treatment, as has been described by Wolffberg. It is not proper open treatment unless the opening and closing of the lids is left perfectly unhindered, and any dressing that keeps the eye in a vapour bath, as all impervious dressings do, only encourages the growth of micro-organisms.

The considerations touched on by Hjort certainly place the open treatment of eye operations in a position far superior to that in which the open treatment of ordinary surgical wounds is now or has ever been; but there is something wanting which is supplied by Praun in the March number of the *Centralblatt*.

It is an obvious objection to this treatment that it affords no protection to the eye from the danger of injury or infection by contact with the patient's hands, etc. Praun obviates this danger by employing the mask introduced by Fuchs some years ago for the purpose of preventing pressure on the globe by injudicious bandaging. He, of course, applies no dressing under the mask.

It is hardly necessary to observe that this method of

treatment is not indicated when the wound (surgical or accidental) is so situated that it gapes if the lids are opened.

J. B. S.

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**ISRAELSON** (Smolensk). **Transplantation of Mucous Membrane from the Lip in Trichiasis and Entropion.** *Centralbl. f. Augenh., October*, 1897, *p.* 299.

The method of operating adopted by Israelson does not differ essentially from that described in this Journal in 1895, p. 369, but some modifications in technique are worth noting, so that a brief description of the manner in which he performs this most useful of all the innumerable operations that have been advocated for the cure of entropion and trichiasis may be interesting to the readers of THE OPHTHALMIC REVIEW.

Israelson does not employ Snellen's lid clamp as modified by Knapp, but uses the antique "shoe-horn" of Jaeger, which he asserts acts as a nearly perfect hæmostatic if properly employed.

The customary intermarginal incision is made in the usual way, but to a much greater depth than is usually found necessary. He makes it to the depth of 5 or 6 mm. In addition he makes an extra incision at each end of the lid upwards to the extent of 3 or 4 mm. (The operation is described as done on the upper lid.)

If the exposed tarsus is much thickened and curved, more or less of its substance is cut away; if not, the second act of the operation is at once commenced, *i.e.*, the excision of the piece of mucous membrane. Israelson uses two special instruments for this, a clamp of his own for application to the lip instead of Knapp's, and a double knife with which a flap of any width necessary can be cut out.

This flap is placed on the wound in the eye-lid and fixed there not by sutures as usually practised in this country, but by a piece of gauze which is inserted under the lid and then turned up over the transplanted flap; over this goes some sterilised wool, and on top some waterproof.

Israelson has never used sutures, and is thoroughly satisfied with the results of his experience of this operation, as indeed all who have seriously tried to cure entropion by transplantation of flaps of mucous membrane would expect. The clamp for the lip seems from its description to be an improvement on Knapp's, but the omission of sutures is not a proceeding to be recommended at least to those who have not already performed the more certain operation with sutures.

J. B. S.

# OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Mr. H. R. Swanzy, President, in the Chair.

Thursday, March 10, 1898.

*The Aseptic Treatment of Wounds in Ophthalmic Surgery.*—Dr. A. McGillivray read a paper on the Aseptic Treatment of Wounds in Ophthalmic Surgery. After referring to the changes in the treatment of wounds brought about by Lister he went on to speak of recent modifications in method. These modifications consisted chiefly in reducing the strength of the antiseptic solutions used for douching purposes and the adoption of heat sterilisation for instruments and dressings. But when the importance of the natural antiseptic property or natural immunity of living tissues came to be more appreciated some surgeons discarded chemical antiseptics in operations altogether on account of their deleterious action on the tissues of the wound, and adopted sterilised physiological saline solution, as it produced no irritation but tended to keep the tissues as nearly as possible in their physiological condition. Antiseptic solutions, however weak, irritated or benumbed the cut tissues of a wound and thus their natural immunity became impaired. But the antiseptic solutions employed during operations had no germicidal properties unless when kept in direct contact with the micro-organisms for several hours or even days—a very undesirable procedure even if possible—so that their action was purely mechanical and, so far as the removal of micro-organisms was concerned, was limited to those on the surface, just as in the case of douching with normal saline solution. The position, then, of the aseptician and antiseptician was perfectly clear. The aseptician, by employing normal saline solution for douching purposes, and studiously preventing any chemical antiseptic from coming in contact with the wound, trusted to the inherent antiseptic properties of the tissues themselves in warding off or destroying any micro-organisms which might have been

left in or which found access to the wound subsequently. The antiseptician, on the other hand, by employing antiseptic solutions impaired or destroyed the natural antiseptic property of the tissues so that they were thus less able to cope with micro-organisms. A description of the operation for the removal of senile cataract was taken to illustrate aseptic technique in ophthalmic operations. From the time the patient entered the hospital till he was discharged no antiseptic was allowed to come in contact with the eye. The patient's face was carefully washed on the morning of the operation with warm water and soap, special attention being paid to the folds in the skin of the eyelids. The eyelashes were cut short so as to allow the margins of the lids to be more easily treated and to prevent the eyelashes from coming in contact either with the instruments or with the wound during the operation. By means of a special douche the conjunctival *culs-de-sac* were flushed with sterilised salt solution (6 per cent.). The eyelids were in turn everted so as to allow their conjunctival surfaces to be carefully cleansed. This was of the utmost importance, as the conjunctival surface of the upper lid was the innermost and therefore the most important part of the dressing. After applying the speculum the part of the eye corresponding to the wound was again douched and the patient enjoined not to rotate the eye upwards till the operation was completed so as not to allow the wound to come in contact with the margin of the eyelid for fear of contamination. Mechanical cleansing of the conjunctiva with a mop was soon discontinued, as it produced undue irritation. All instruments, lotions, mops, and dressings were sterilised by heat, so that everything that touched the eye was aseptic. Before removing the speculum the eye was douched with a gentle stream of salt solution, the solution being allowed to play over the wound to remove any cortical or capsular *débris*. Some of the solution invariably found its way into the anterior chamber and was valuable in removing soft lens matter without causing any irritation. The dressing consisted of a piece of moist lint applied next the eye and one or two

thin layers of absorbent cotton wool, the whole being kept in position by means of a vertical and horizontal strip of adhesive rubber plaster; only the eye operated on was covered. Throughout the operation and also during the preliminary treatment, every treatment was employed to avoid irritating the conjunctiva as much as possible, because conjunctival irritation produced hypersecretion, for the nearer the conjunctiva was to its normal condition the better for operative interference. The motto in dealing with the conjunctiva should be, "Let sleeping dogs lie."

Mr. Arnold Lawson had just completed the bacteriological examination of ninety-six apparently normal conjunctival sacs. In only two cases had he been able to find pathogenic organisms, the staphylococcus pyogenes albus; several non-pathogenic staphylococci were found, but these were all harmless. He had not found the streptococcus at all. He therefore did not consider that it was correct to say that the normal conjunctival sac was a receptacle for micro-organisms.

Mr. Mackinlay always boiled his instruments and used saturated boric acid lotion for the eye during operations.

Dr. Bronner considered that it was not possible to make the conjunctival sac aseptic, therefore antiseptics were necessary; he always put his knives into absolute alcohol before using them. He believed that cocaine by its action on the cornea favoured suppuration.

Mr. Bickerton always boiled his instruments for two and a half minutes before the operation, and again after using them. He irrigated the eye with perchloride 1 in 5000. He had only seen two cases of suppuration, and both were in hospital practice.

*Ophthalmic Evidence of General Arterial Disease.*—Mr. Marcus Gunn read a paper on Ophthalmoscopic Evidence of general arterial disease. After referring to a case which he had shown at the Society some years ago he went on to describe the appearances seen in the arteries affected, as part of a change in which the arteries of the body generally and of the brain in particular shared. The

general reflex from the vessel was brighter than normal, the central light streak was bright, and the whole artery was of a lighter colour than normal. This was due to a hyaline change in the arterial walls; as a consequence of this change the circulation in the veins was impeded and in some cases the vein became invisible where crossed by an artery. As a further result of this venous obstruction there was set up an œdema of the retina, which might be either general or partial, the effect of which was to blur the details of the fundus. In some cases the size of the arteries was not uniform; the vessel would be narrowed at one spot or increased in a certain part of its course; this change was most often seen in the small arteries in the region of the macula. The arteries were sometimes very tortuous. The central streak was narrow, bright, and with points of greater brilliance in it; this condition was also seen in hypermetropia and after optic neuritis in the vessels arising from the optic disc, but in diseased vessels it was those of the second and third magnitude which should be looked at. There was a loss of translucency of the arteries, so that where the vein passed behind the artery it could not be seen. On the other hand, if the vein covered the artery, the artery could be unduly seen through the blood column in the vein, because of the thickening of the arterial coat and partial emptying of the vein by the thickened artery as the two crossed each other. As a consequence of the hardness of the arteries there was an interruption of the venous current, the vein was distended, and hæmorrhages often took place along its course. The change in the arteries was a change in the coats, an irregular thickening; with this there was a loss in carrying power, and hence tortuosity. The change in the veins was due to the damming back of the blood; the walls of the veins and capillaries underwent degeneration, hence arose the hæmorrhages. The question of etiology was one for the physician. The change usually occurred between forty and fifty. If well marked at this age the prognosis was grave. The patients had often been subject to migraine, indigestion, or gout. Chronic alco-

holism was also a factor in the causation. In some of the cases known as hæmorrhagic glaucoma this affection of the vessels was the cause of the change which gave rise to the hæmorrhages. It was in close association with renal disease, but the vessels of the eye and brain might be affected before the kidney. He had examined the eyes of all the patients in the National Hospital at one time who had had hemiplegia. In seven the arteries were normal, in ten they were affected, and in seven the changes were quite characteristic.

*Card Specimens.*—The following were shown :—

Mr. Devereux Marshall : Epithelial Tumour of the Cornea.

Mr. Mackenzie Davidson : Foreign Body localised in the Lens by means of X-Rays and successfully removed.

Mr. Holthouse and Dr. Batten : Tumour of the Lacrymal Gland.

Dr. Batten : Congenital Symmetrical Tumours of the Lacrymal Gland.

Mr. C. J. Ayres : Drawings of Tumours of the Caruncle.

Mr. S. Stephenson : Deposits on the Intermarginal Space of the Lower Lid.

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## AMERICAN MEDICAL ASSOCIATION—SECTION OF OPHTHALMOLOGY.

(*Continued from p.* 66.)

*Extensive Nævus of Lid and Conjunctiva.*—Dr. G. O. Ring (Philadelphia) reported the case of a child, 18 months old, in whom at birth there was only a small mark near the edge of the upper lid, but it had greatly increased in a few months. Later ligation was tried, five deep sutures being used, which produced an extensive slough and checked the growth for four or five weeks. Then it began to cause protrusion of the conjunctiva, which had increased until a

purplish red mass projected some 12 mm. from beneath the outer two-thirds of the upper lid. Electrolysis had been tried five times and seemed to cause slight contraction, but the result was not very encouraging.

Dr. H. Knapp thought these tumours should be extracted. He had treated them with electrolysis with very poor success. Even such as extend deeply in the orbit can be removed by operation.

Dr. S. C. Ayres had, in the case of a very delicate baby, three months old, checked the growth for several months by electrolysis and subsequently had been able to dissect it out.

*Melanotic Sarcoma of the Conjunctiva.*—Dr. A. R. Baker (Cleveland) reported the case of a man, aged 69, who had a dark purplish lobulated tumour of the left eyeball springing from the ocular conjunctiva to the nasal side of the cornea, three-quarters of an inch in length by half an inch in breadth and thickness. It had first been noticed as a small dark spot one year previously. It prevented rotation of the eye inward, causing diplopia on looking to the right. During the next three months it grew rapidly, and after alarming hæmorrhage the patient consented to its removal. It was found to be pedunculated and very superficially attached to the conjunctiva, and was readily removed with forceps and scissors. When the patient was seen three years later, vision was perfect and there was no recurrence of the tumour; but he died five years after its removal, probably of a similar growth in the liver.

Microscopic examination showed it to be a sarcoma with much pigment.

*Sarcoma of the Iris.*—Dr. C. A. Veasey (Philadelphia) reported a case of small-celled sarcoma occurring in the upper inner quadrant of the left iris of a man aged 46; the growth was removed by a broad iridectomy. He also gave, from the literature of the subject, a summary of forty-six cases which had been reported.

*Anomalies of the Iris.*—Dr. W. C. Posey (Philadelphia) reported two cases, one of partial aniridia, the iris being

only 2 mm. wide at its broadest part, and forming a ring with irregular edges surrounding the large pupil. Both eyes were similarly affected.

The second case was one of ectopia pupillæ in the right eye, the pupil being displaced down and out, ovoid with its apex 1 mm. from the limbus, having a perfect sphincter and reacting well to light. In the left eye the iris was almost separated into two concave segments by a slit-shaped pupil extending at an angle of 70° with the horizontal plane upwards and outwards.

*Treatment of Trachoma.*—Dr. J. E. Weeks (New York) thought all operations for marked trachoma should be performed under ether or chloroform. Cocaine anæsthesia entails too much pain and unduly hurries the work of the surgeon. His plan was to scarify, making a superficial incision parallel to the lid margin, and then to press out the lymphoid masses, preferably with Noyes' forceps, by a gentle stripping movement, avoiding undue pressure and tearing of the conjunctiva. With a moderately soft tooth-brush, a solution of sublimate 1 to 500 was then introduced into the conjunctival tissue. Subsequently adhesion between the folds was to be broken up, and the eye irrigated with a sublimate solution of 1 to 1,000 every twenty-four hours.

*Use of Jequirity for Trachoma.*—Dr. W. Cheatham (Louisville), speaking from his own experience, knew of no other treatment that would take the place of the use of jequirity in trachoma. He had had from it only the best results. He used it in the form of powder to be dusted upon the affected surface; the advantage being that the reaction is often less severe, and the surgeon is enabled to limit its action to the affected tissue. Weak infusions were also of benefit. He had never seen corneal ulcer follow its use. He had seen a few cases of xerosis, but none that he could say depended on this medication.

*Treatment of Entropion due to Trachoma.*—Dr. F. C. Hotz (Chicago) thought it very desirable, and not so difficult as might appear, to bring order into the chaos of operations

practised for this purpose, if it were clearly formulated what a rational operation should and should not do. The first serious consideration was the cosmetic effect of the operation. Such entropion operations as permanently disfigure the eye-lid should be struck from the list of legitimate ophthalmic operations. The second rational indication is to remove those structural changes which cause the inversion. The prevalent idea is that entropion is caused by shrinkage of the tarsal cartilage and cicatricial contraction of the palpebral conjunctiva. This is incorrect. Long before the posterior edge of the lid margin shows the slightest disturbance, the eyelashes droop, and the skin along their roots forms a fold falling down over and hiding the anterior edge of the lid border; the skin and cilia have slipped down on the outside of the tarsus. This is undoubtedly due to continued and oft-repeated spasm of the orbicularis muscle. This being the case, the dislocated skin and muscle must be drawn up upon the external surface of the tarsus and fastened to it to prevent their slipping down again. The skin thus drawn up is to be stretched sufficiently to turn up by its traction the drooping cilia, and the inclined lid margin.

The lid skin being well put on a stretch, a transverse incision extending from canthus to canthus is made through skin and muscle a little below the upper border of the tarsus. The lid portion of the skin and muscle thus divided from the supratarsal portion is dissected up from the tarsus down to the roots of the eyelashes, and the muscular fibres covering the upper border of the tarsus are excised. The lid skin is then drawn up over the tarsus and fixed to its upper border by three silk or catgut sutures, which enclose within their loops only the skin borders of the incision and the upper tarsal border and, therefore, when tied, close the original wound and establish a firm union of the skin with the tarsus.

In many cases the cartilage is so small that the incision must be made very close to the cilia, and in these it is necessary to add an intermarginal incision, and to fill the marginal wound with a graft of skin or mucous membrane,

*Surgical Treatment of Trachoma.*—Dr. Harold Gifford (Omaha) reported ten years' experience with different methods of surgical treatment, each of which was capable of doing good, but none of which was applicable to all cases, and it was rare that any one of them was sufficient for any given case. They were only contra-indicated in acute trachoma, which if seen a few days from the start could be cured in from three to six weeks by daily applications of copper crystal. In practising expression he used ring forceps, one portion of the ring having a narrow edge that enabled it to seize infiltrated tissues in corners where it could not be grasped by other forms of forceps. He preferred to go over the tissues at least three times with gradually increasing pressure. To prevent adhesion after extensive operations he had everted the lids by stitches passed through their margins and attached to the cheek or brow, these being removed after twenty-four hours. With expression he combined excision and sharp curetting where there was dense non-gelatinous infiltration of the folds and edge of the upper tarsus. For excision of the folds he used no special clamp, merely raising the fold with a fine-toothed forceps, and excising as broad a strip as seemed necessary. Occasionally, he had practised deep excision of the diseased tissues with grafting of lip membrane to replace it. The use of the actual cautery was limited to cases with small deeply infiltrated islands of trachoma. Where the islands were larger he used the sharp spoon or scarification. Brushing seemed a very crude and inaccurate method.

He also called attention to the dangers of surgical treatment which, though of great value, should not be used by those not thoroughly versed in the diagnosis and treatment of all diseases of the conjunctiva and cornea.

Dr. S. L. Ziegler (Philadelphia) urged that the persistence of trachoma was due to partial occlusion of the tear duct with consequent epiphora and regurgitation of septic secretion, maceration of the cornea and friction from tarsal pressure with erosion of the corneal epithelium. For this he practised rapid dilatation of the lacrymal passages, using

a dilator the size of a No. 10 probe, and an extensive canthoplasty.

*Trachoma in Southern California.*—Dr. H. B. Ellis (Los Angeles) found that trachoma furnished less than 1 per cent. of his practice, both private and hospital, and inquiries addressed to others engaged in ophthalmic work throughout that State showed that all of them had a similar experience. The bulk of the population live at an elevation of 1,000 feet and not far removed from the sea, but the climate made an out-of-door life the rule, and to this, with good sanitary conditions, he ascribed the rarity of the disease.

*Hyperphoria.*—Dr. J. T. Carpenter (Philadelphia) thought there were included as cases of hyperphoria, or tendency of one visual axis to deviate above the other, some which should be regarded as spurious, these being due to general disease, or disease of the central nervous system, or to abnormal refractive or muscular states. True hyperphoria included concomitant, spasmodic and paretic cases. The clinical study of such cases should include the estimation of refraction, determination of tension of extra-ocular muscles as indicated by their ability to overcome diplopia produced by prisms properly placed; measurement of the field of fixation, monocular and binocular, and an employment of all the tests which tend to remove the strong impulse to binocular single vision and reveal latent defects, such as the red glass, Maddox rod, etc.

*Amblyopia ex Anopsia.*—Dr. A. C. Simonton (San José) thought that even a partial restoration of vision when the eye was brought again into use, established the doctrine of amblyopia ex anopsia as well as full restoration of vision, of which he reported a case. A girl, aged 8, had convergent strabismus of high degree from 3 years of age, and vision in the squinting eye of $\frac{16}{60}$ths. Convex lenses removed the squint and in three and a half months brought up the vision to $\frac{16}{16}$ths.

Dr. Leartus Connor (Detroit), from a study of 7,500 cases of imperfect vision seen in private practice, including 219

cases of convergent squint and 127 of amblyopia of whom only 54 squinted, thought that there were undoubted cases of amblyopia from congenital imperfection characterised by central scotoma and being unaffected by any treatment; they are found in eyes that squint, in hyperopic and astigmatic persons, anisometropes and in eyes free from one or more of these defects. There is no positive evidence of the existence of amblyopia from suppression, viz.: a loss of sight from the inhibitory action of the brain upon the visual centre. There is a class of cases characterised by lack of persistent vision rather than absolute loss; by the absence of scotoma, improved often by proper management. They are never congenital, are found in all varieties of refraction and all sorts of muscular disturbance; and are of the same nature as diminished functional power of any sound organ from non-use or diminished use. There is a class of cases in which an eye with congenital amblyopia is still farther crippled by disuse; in these proper management often produces satisfactory results in removing the latter factor.

*Examination of the Eyes of School Children.*—Dr. Frank Allport (Chicago) reported upon a plan of examination that had been in operation for the past year in Minneapolis. A superintending oculist was appointed, who at the beginning of the autumn term delivered a lecture to the principals of the schools upon practical ocular anatomy, physiology, refraction and its errors, and the general use of the eye, and demonstrated the method on a certain number of pupils. He was also accessible to the principals for subsequent advice and counsel, and received the principals' reports and submitted them to the Board of Education with deductions and recommendations.

The tests were made as near as possible to the beginning of the autumn term. It was found out whether the children suffered habitually from red or inflamed eyes or lids, after which the vision was tested with Snellen's test-type, and the line of type read at the standard distance recorded. It was also ascertained whether the children habitually suffered

from asthenopia. If the eyes were constantly inflamed or the vision defective in either eye, or if there was asthenopia, a card of warning was sent to the parents, advising them to consult an eye-doctor, or to take the child to a dispensary. The reports were also intended to include a statement as to whether this had been done, and what had been the result of it. Of 25,696 thus examined 8,166 were deemed ocularly defective. The percentage ranging in different schools from 11 to 67 per cent. The reports showed that more than 1,000 pupils had been distinctly benefited by the test. It was found quite impractical and useless to examine children in the first grade. This plan was not offered as perfect, nor was it a method for accumulating scientific data.

*Asthenopia from a Bad Working Point.*—Dr. C. H. Thomas (Philadelphia) reported the case of a boy, aged 15, with disturbing symptoms of asthenopia during school work, so severe that he had lost about two years from his studies, and the question of withdrawal from school was considered. There was very little error of refraction, but he habitually held his book at something less than seven inches. A working distance of thirteen inches was advised, and gave complete relief of all symptoms. A bad reading distance was deserving of more consideration than it had yet received apart from its relation to myopia.

*Full Correction of Astigmatism.*—Dr. L. J. Lautenbach (Philadelphia) urged that the full correcting glasses should be used in all cases of astigmatism and worn constantly; and that such use of them would influence favourably the condition of both the ciliary muscle and the recti muscles.

*Use of the Binocular Magnifier.*—Dr. Edward Jackson (Philadelphia) exhibited the different forms of this instrument (see OPHTHALMIC REVIEW, 1896, pp. 129 and 250) including one attached to a metal head-band for use in operating. In the form with separate prisms no special adjustment for the width between the surgeon's pupils was necessary, such adjustment being effected by moving the instrument to or from the eyes. The strength of the lens

used should not be greater than that of the monocular magnifier to which the surgeon was accustomed.

The form for use in operations was furnished with a three-inch lens which was placed about three inches in front of the surgeon's eyes, giving a space of six inches, which had been found satisfactory. The strength could be increased by the use of compound lenses corrected for spherical and chromatic aberration; but the latter at the centre of the field was corrected physiologically. The dispersion being in opposite directions in the two eyes neutralised itself in binocular vision.

*Anomalies of Retinal Pigment.*—Dr. H. Gradle (Chicago) discussed the appearances due to the irregular distribution of pigment in the retinal layer and their clinical significance. His paper was based upon forty cases occurring in patients aged from five to twenty-two years. In all the cases there was exaggerated asthenopia, ocular discomfort out of proportion to any existing refractive or other anomaly. The inferior nasal quadrant of the fundus was most affected. He compared the appearance to that of a surface covered with a mixture of black and reddish powders with preponderance of the latter. Most of the separate grains were barely within the range of visibility. Occasionally, a few larger, blacker points, and less commonly, a few white specks were found. There were even small areas with so little pigment that the choroidal vessels were visible. The most striking appearances were found in pronounced cases of nervous disturbance. They did not seem to affect visual acuity. The pigmentary changes were not necessarily permanent. In six cases watched from several months to six years the appearances diminished or entirely disappeared. Treatment consisted in rest of the eyes, general hygiene, and especially measures directed against the neurotic condition.

*Embolism of the Central Artery of the Retina.*—Dr. C. F. Clark (Columbus) reported three cases in which a portion of the retina retained its vascular supply and continued to perform its function.

A woman aged 51 had a defect in the vision of the left eye for nine days. It began with a glimmering and in a few moments the whole visual field became clouded, except a small space near the centre. Vision $= \frac{6}{30}$; the field was reduced to two inches vertical and three inches horizontal, measured one foot from the eye.

The ophthalmoscope showed the papillo-macular region to be normal, but surrounded by a whitish œdematous zone. The normal area was triangular in shape, its base toward the disc, its upper and lower borders formed by vessels which seemed to emerge from the disc at some distance from the retinal vessels, so that their origin might be behind the situation of the embolus.

The second case occurred in a woman aged 34, who had a fall in the evening, and on awaking next morning found vision of the left eye defective, and the field greatly limited. Vision $\frac{5}{12}$, in a triangular field with its apex near the point of fixation and its base to the temporal side. Beyond this area there was absolute blindness. The corresponding portion of the retina formed an irregular triangle with its apex near the macula and extending into the nasal quadrant. This area was but slightly œdematous and bounded by two vessels of apparently deep origin in the disc; beyond it there was greyish œdema. The patient's vision continued unchanged until three months later an accidental blow was followed by a scotoma in the best part of the remaining field, after which she could only count fingers at one or two feet.

The third case was that of a man aged 33, who while camping out awoke one morning to find vision defective in the lower portion of the field. There was blindness below a horizontal line passing a little above the centre of the field, but he still retained normal central vision. The lower half of the retina was normal, the upper half white and œdematous, the lower border of the œdema being clearly defined. There was a short red crescent, convex upward, above the apparently normal fovea. He was first seen the day after the lesion was noticed, and four days later there was improvement in the defective

portion of the field. Two months later there was pallor of the optic disc and the superior retinal artery was somewhat diminished in size. The field of vision had improved so that objects could be seen 15 or 20 degrees below the centre.

Dr. Clark regarded the preservation of a portion of the field as due to supply from a branch of the central artery coming off deeper than the point at which the embolus was lodged.

*Muscle Shortening.*—Dr. J. O. Reynolds (Dallas) described a method which he had found satisfactory for its accuracy and freedom from pain. With broad fixation forceps, with teeth sufficiently long to engage all the tissues down to the sclera, the conjunctiva, capsule, and tendon of the muscle were grasped in such a way as to produce a loop of tendon. This loop was fixed with a single suture of kangaroo tendon which was left to be absorbed. A small incision permitted the suture to sink through the conjunctiva. The operation could be done in less than one minute involving no pain or subsequent discomfort, and would correct with precision ordinary degrees of heterophoria.

*New Instruments.*—Dr. A. E. Prince (Springfield, Ill.) presented an instrument for measuring heterophoria and testing the power of abduction, adduction and sursumduction. It consisted of rotary prisms combined with a multiple Maddox rod. The prisms being each $7\frac{1}{2}°$ gave a combined effect varying from zero to 15°.

Dr. J. E. Jennings presented a special mirror for retinoscopy. It was plane, 2 centimetres in diameter with a central opening of 3 millimetres, set in a piece of metal 5 inches long and $1\frac{1}{4}$ inches wide; to this was fastened the second piece of metal that closed over the mirror to protect it from dust, and when open served as a handle on the principle of a lorgnette. A portion of the first piece of metal served as a shade to shut off the surgeon's eye not used in the test.

Dr. J. W. Croskey (Philadelphia) showed a new form

of ophthalmoscope, in which the lenses were arranged in two discs. One disc contained the weaker lenses, from 6 convex to 8 concave; the other disc contained additional lenses to 20 convex and 24 concave. The change from one disc to the other was made by simply sliding the small tipping mirror, without taking the instrument from the eye.

Dr. J. L. Borsch showed an ophthalmoscope in which, in addition to tilting, the mirror could be revolved round its axis, or the whole instrument could be revolved round the axis of the lens disc, so that the mirror could be placed in any desired position without disturbing the position of the lenses.

# TENECTOMY FOR STRABISMUS: A SIMPLIFIED OPERATION.

By Priestley Smith.

Professor of Ophthalmology Mason University College, and Ophthalmic Surgeon Queen's Hospital, Birmingham.

If the shortening or advancement of an eye-muscle were as simple and expeditious a proceeding as the division and setting back of its antagonist, we should, I think, employ this method more frequently than at present in the treatment of strabismus. There are many cases in which, other things being equal, one would choose to alter the position of the eye by increasing the effective power of the one muscle rather than by lessening that of the other, or at least to do both in moderation rather than the latter to a greater extent. It is not my purpose at present to discuss the proper application and combination of these two principles; I desire merely to describe a method of shortening a tendon which seems to me to be a step in the direction of greater ease and simplicity.

The instruments required are the speculum, fine conjunctival forceps, hook, and scissors, as for a simple tenotomy; a special tenectomy forceps with catch (fig. 1), like Prince's, but bent in a different direction so as to be applicable to either eye and without the prosecting points; a narrow bent keratome or "bent broad needle;" a needle holder, and a single black silk thread armed with three curved needles, one at the middle, one at each end. Each needle when threaded should be passed through the thickness of

the thread as near as may be to the eye ; this prevents its dropping off but involves no knot.

*Procedure.*—Along the lower border of the tendon which is to be shortened make a horizontal incision through conjunctiva and underlying connective tissue


FIG. 1.

long enough to permit the hook and forceps to be passed easily beneath the tendon side by side (fig. 2). Introduce the hook and hold it against the insertion of the tendon. By the side of the hook, but at 1 mm. from it or a little more, pass in the hinder blade of

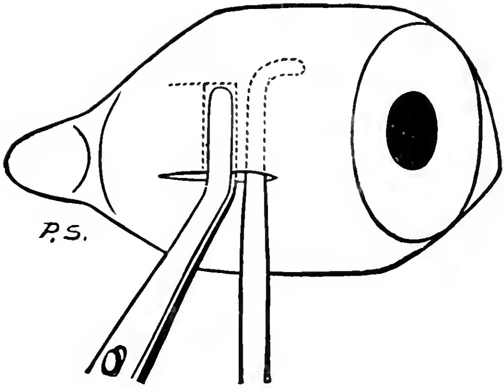


FIG. 2.

the forceps and clamp tendon and conjunctiva together. Withdraw the hook and introduce in its place one blade of the scissors. Divide tendon and conjunctiva together, thus leaving an anterior stump 1 or

2 mm. long, the posterior stump being held by the forceps. Make another short incision backwards from the tip of the forceps parallel with the original incision. Then, holding the posterior stump a little away from the globe, pass the middle needle through it from within outwards, taking care that it passes through the horizontal meridian of the globe, namely, in a line drawn from the middle of the pupil to a point somewhat above the level of the canthus (fig. 3). The

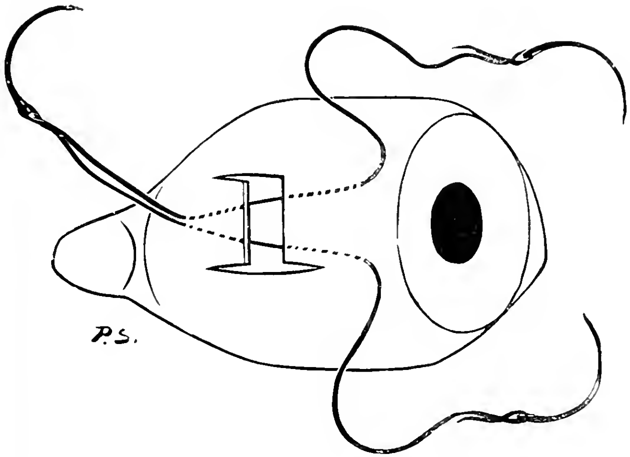


Fig. 3.

needle should generally emerge about midway between the forceps and the canthus, but the exact point will vary with the amount of effect desired. Having drawn the double thread through to a sufficient length, cut off the posterior stump close, or near, to the forceps, thus removing the forceps together with the tissue clamped between the blades. Now seize the anterior stump with the ordinary forceps and tunnel through it with the keratome before trying to pass the needle. The point of the keratome should enter the back of

the stump at the line of its junction with the sclera, and should pass forwards so as to slightly split the sclera and appear beneath the conjunctiva 2 or 3 mm. nearer to the corneal margin. When the point is visible beneath the conjunctiva withdraw the keratome and pass one of the terminal needles along the track thus made. Tunnel again and pass the second needle in like manner and so that the two threads emerge near to the corneal margin and about 5 or 6 mm. apart. Cut off the needles.

If the antagonist is to be tenotomised, gather the four threads together, give them to the assistant, and let him draw the eye over into the necessary position. Divide the antagonist. Separate the two threads which perforate the posterior stump, and having ascertained which passes to the upper, which to the lower, puncture in the anterior stump, tie each upon itself, drawing it together in the first place merely with a double twist, and making sure that both sutures are drawn tightly and the divided tissues brought well together before tying the final knots. Cut off the threads near to the knots. Cover the eye closely with pad and strapping.

This operation is easily performed. It shortens the tendon with a minimum disturbance of the parts concerned and produces little puckering of the conjunctiva, little subsequent swelling, and for the same reasons less pain than when a large tract of conjunctiva is included in the sutures. I have performed the operation more than twenty-five times, and except in one or two of the earliest cases, and in some coming from distant places, have allowed the patient to go home at once as after a simple tenotomy. I should not consider this safe, however, unless the eye were closely covered by a pad held immovably in place by adhesive plaster. The dressing has usually been removed on the second or third day and replaced for two or three days more. In order to give the sutures a good hold

anteriorly the needles must pass beneath some fibres of scleral tissue in front of the insertion of the tendon. It seems to me easier and safer to guide a perfectly pointed narrow keratome in the right direction than to force a passage with the ordinary needle.

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## RETINAL CHANGES IN THE MACULAR REGION IN CASES OF INJURY.

By Leslie Buchanan, M.B.

Pathologist and Clinical Assistant, Glasgow Eye Infirmary.

Whilst making examinations of eyes removed on account of injuries, the writer has been struck by the frequency with which it is found that although the major part of the retina appears to be healthy the macular region is raised like a ridge above the general level.

In order to explain this change, if possible, and hoping to find some relationship between it and the destructive changes often seen ophthalmoscopically in the macular area, in cases where an eye has recovered from the immediate effects of an injury, sections have been made, including the macular area, of several eyes in which such peculiar changes were found.

In each eye examined it has been found that the macula and the retina for a short distance round it had been raised from the hexagonal pigment layer; and that, in the more advanced cases, the retina was folded upon itself once or twice.

It should be understood, before going further, that

by the word retina, as used here, only those layers which lie internal to the hexagonal pigment layer are indicated.

The simplest change observed was elevation of the macular depression from the pigment layer, the elevation produced being long horizontally and narrow.

A further change resulted from the raising of the retina round the macula, more especially at the external extremity of the primary folds.

Again it was seen that increase of the swelling at the extremity of the primary fold, and dipping in the centre of it, gave rise to a secondary fold which lay transverse to the primary or parent fold.

Lastly, it was found in many cases that this secondary folding had gone on still further, and that a second transverse fold had been formed, giving the retina the appearance, in transverse section, of a letter S with its folds tightly compressed. It was also found that, in many cases, there was a considerable amount of inflammatory exudate agglutinating the plicæ and fixing the layers together.

The explanation which seemed to account for these changes most satisfactorily was as follows :—

Congestion without or with œdema produces an increase in the bulk of the retina, which is forced to yield in some direction. The pressure may be with some reason imagined to be lateral and directed to the macula as a focus.

On account of the external support from the sclerotic expansion in the direction of the convexity of the curve of the retina is prohibited, whereas the vitreous body is able and likely to give way to a slight extent. Simple inversion of the macular depression is the result, giving rise to an elongated ridge the shape of which may be accounted for by the position of the nerve fibres of the retina with regard to the macular area. These nerve fibres in the inner fibrous layer

sweep along the margins of, and round the external extremity of, the macula, whereas the fibres of Henle's layer pass very obliquely down the sides of the macular cup.

It is quite probable that the formation of the second fold which lies transverse to the first is also determined by the same above-mentioned arrangement of the nerve fibres. Once these folds have begun to form the pressure of the vitreous body tends to obliterate them, first, by re-invaginating, as it were, the macular depression, and second by compressing the folded retina firmly so that the surfaces are in close apposition and generally firmly united.

As regards the result of this process, it is easy to understand that central vision must be either permanently impaired or lost, as the bacillary layer is destroyed over a greater or less area according to the severity and duration of the congestion.

Although the hexagonal pigment layer remains in position on the membrane of Bruch, a certain amount of change resulting in irregular distribution of pigment is found to occur in it over an area corresponding closely to that of the folded retina. This, then, may be the explanation of the changes observed ophthalmoscopically in those cases where the eye has to a certain extent recovered from an injury.

It is known clinically that after injury to an eye vision may be more or less completely lost, whilst opthalmoscopic examination reveals no signs other than œdema; also that in these cases either complete recovery or permanent loss of sight may ensue.

This fact may be explained, too, by supposing, with fair reason again, that such folds might be invisible ophthalmoscopically, so that it is quite possible that in those cases of permanent loss the macular area may have been folded.

Early in the present century folds of the retina in the region of the "foramen of Sömmerring" were noticed and depicted accurately, notably by Dalrymple and others. Such folds, at first thought to be natural to that region, were ultimately considered by authorities such as Dalrymple,[1] Tyrrell,[2] &c., to be the result of *post-mortem* changes. Although it is quite possible that the retina might become folded when the intra-ocular tension is far diminished, and, further, that folds thus formed would take a similar shape on account of the anatomical peculiarities of the structure, still it is probable that not even the majority of these folds are of such origin, for the following reasons.

The agglutination of the folds which is frequently observed is undoubtedly a pathological process—the cases in which such changes have been observed were all cases of injury; similar folds are formed in the retina and have been observed ophthalmoscopically many times and depicted clinically.[3]

Such folds are situated near and concentric with the optic pores, and are the result of displacement outwards of the external layers of the retina by the pressure of the bulging œdematous nerve bundles, as they emerge from the lamina cribrosa to turn over the edge of the sclera and choroid. They are of little subjective significance, but indicate pathologically and clinically the severity of the œdema. They are often seen in cases of uncorrected ametropia, where congestion of the nerves exists in a high degree, but otherwise they may be seen in neuritis of almost any form, provided there is not too great opacity of the nerve.

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[1] Dalrymple, "The Anatomy of the Human Eye," p. 78 *et seq.* London, 1834.

[2] Tyrrell, "Diseases of the Eye," vol. ii., p. 93. London, 1840.

[3] Gowers, "Medical Ophthalmoscopy," pl. vii., No. 1. London, 1890.

**ALBERT PETERS (Bonn). Tetany and the Causation of Cataract.** *Fr. Cohen, Bonn*, 1898, *pp.* 63.

A form of cataract beginning in and remaining for long confined to the nucleus, was described by Becker as occurring in persons of 40 to 50 years of age, who almost always presented an appearance of ill-health, and very frequently gave a history of having suffered from "convulsions." Saemisch further pointed out that enquiry into the nature of the convulsions in such cases will elicit that they were not attended by loss of consciousness, and that the hands assumed the so-called "obstetric position," that the patients, in fact, were suffering from tetany. In the present pamphlet Peters gives a description of two fairly typical cases of this kind, in which he was able to examine the lenses, and bases on them some remarks setting forth his views on the subject of the formation of cataract in general.

*Case* 1.—A woman of 36, well nourished, but always pale. In 1892, after prolonged diarrhœa, she began to suffer from "convulsions." At first they would occur ten times in the day, each attack lasting a quarter of an hour, and the liability to them would continue for three months at a time, but gradually they had become less frequent and of shorter duration. They began in the hands, which became stiff, the forefinger and thumb in contact, the other fingers bent at the metacarpo-phalangeal joints and extended at the others. Cramps in the feet, in the back, and occasionally in the abdomen, followed; the head remained free, unless she used means to check the diarrhœa, then the muscles of the face and eyes would be affected, the eyes becoming fixed and the sight much impaired while the attack lasted, recovering again when it passed off. But after a time some permanent affection of vision was noticed, and this had gradually increased.

On examination, each eye showed a nuclear opacity of the lens, measuring 4 to 4½ mm. in diameter, not very sharply defined from the cortex, which was itself

opalescent, but allowed some red reflex to be seen through its peripheral parts.

In extracting the lens the capsule was opened and a large yellow nucleus extruded with some cortex adhering to it. This nucleus was obviously considerably larger than the opacity previously observed; the latter could be seen in its centre surrounded by a more translucent rim.

*Case* 2.—A woman aged 40, somewhat pale, but otherwise fairly healthy-looking. She had suffered from convulsions in childhood. Had borne ten children, of whom only one survived; the others had all died of convulsions in infancy. In her second pregnancy she began to have "convulsions," and they recurred in each succeeding pregnancy. They were quite similar to those in the first case, beginning in the hands, affecting also the back, the jaws, and the eyes; the eyes looked fixed and vision was impaired. The first permanent affection of vision was noticed after a specially severe attack in which the tongue had also become stiff, and speech and swallowing were affected.

In this case the cataract in the right eye had already been operated on when the patient came under the author's care; the left presented the appearances of an ordinary senile cataract, the cortical opacity being diffuse and not very dense, so that it could be fairly well made out that there was no defined nuclear opacity like that in the former case; indeed when extracted, the lens appeared diffusely opaque peripherally and somewhat transparent towards the centre.

Microscopically, the lenses presented corresponding differences. In the first case the most striking feature was a wide fissure, filled with granular material, passing transversely across the lens so as to divide it into anterior and posterior halves, except that the fissure curved forward a little at the centre so as to avoid the most central portion of the nucleus, while this was further incompletely outlined posteriorly by two small subsidiary fissures; the central portion with its bounding fissures

corresponded in size with the opaque nucleus visible during life. The rest of the lens presented numerous smaller fissures, filled, like the large one, with small refracting granules having an average diameter of 5 $\mu$. The fissures became much smaller towards the posterior pole, being here mere splits between the fibres without visible contents. In this region too, were many small vacuoles, some round, some oval, with the long axis parallel to the lens fibres, some of the longer oval ones passing by extension at each extremity into short fissures. The fissures, of whatever size, always lay *between*, not in, the fibres, the latter showing no pathological changes, except that the very outermost or sub-epithelial layers of the remnants of cortex appeared degenerated.

In the second case the lens showed no transverse fissure; the main pathological change consisted in the presence of numerous small vacuoles, for the most part oval in shape, and so numerous as to form an almost continuous band in the outer part of the nucleus, but much more scanty, and of rounder form, towards its centre. In this lens also the transition from oval vacuoles to small fissures was very apparent. The larger spaces contained granular material similar to that occupying the fissures in the former case. The remains of cortex showed wavy, separated and torn fibres, with a little vacuolar degeneration of the outermost layers. "The arrangement and form of the vacuoles, and their scanty occurrence in the centre of the nucleus are so characteristic that, if the cortex be left out of account, the case must be called one of 'lamellar cataract.' That is to say, it is a case of complete cataract whose nucleus presents the typical changes of lamellar cataract, which changes must, from the clinical history, have developed in later life; and thus this second case of cataract, occurring in connection with tetany, presents similar changes to the first. The only anatomical distinction consists in the incompleteness or absence of a vacuolated zone in the anterior part of the nucleus in the first case, and clinically in the different degree in which the cortical layers have contributed to the formation of the cataract. Whilst the

first case suggests rather a lamellar cataract with incomplete cortical opacity, the latter resembles a complete cataract, whose cortical opacity prevented the recognition of the nuclear changes."

For comparison with these cases the author now describes and gives microscopic drawings of two cases of ordinary senile cataract extracted in their capsules. Briefly stated the conditions found were as follows:—The central part of the nucleus was unaltered. Its peripheral zones were studded more or less closely with small vacuoles, round or oval, with transitional forms between these and small fissures, and with larger fissures filled with granules. The cortex showed no changes in the fibres themselves (except that some considerable bundles of them on the surface were abruptly torn and their ends retracted), but contained numerous fissures and spaces between the bundles, either empty or filled with granular material.

He considers that since all transitions can be observed between the round vacuoles and the fully-developed fissures with their granular contents, all these changes must be looked on as being of the same essential nature. All are to be regarded as results of the shrinking of the nucleus, which squeezes out of itself minute droplets (the vacuoles), which, as they increase in size, develop into fissures, while later, by coagulation of their fluid contents, the granular material is produced, the opacity of which is the cause of the cataract. Degeneration of the fibres themselves may play some part in the production of opacity, but if so it is a quite subsidiary one. The reason that the effect of the shrinking remains limited to the nucleus in lamellar cataract, while in senile cataract it extends to the cortex, lies in the fact that the elastic fibres of the young lens are able to follow the shrinking nucleus, while the more rigid ones of later life cannot do so without buckling up and producing fissures.

The primary cause of the shrinking of the nucleus is to be sought in a diminution of its supply of nutritive fluid. In the case of tetany the author evidently considers that

the ocular spasm must cause such a diminution in the blood supply to the lens, speaking of its effects as analogous to those of eserin ; but the only evidence he adduces that the spasm of tetany affects the ciliary muscles consists in the statement of his patients that vision was dim during the attacks, while of its influence on the muscles of the blood-vessels no evidence is brought forward at all. He is inclined to regard tetany as the real cause of lamellar cataract of infancy, and says that the spasms, if they affected the eyes alone, might very well pass unnoticed. The rickets, which has so generally been held accountable for the changes in the lens, he would look upon as acting only indirectly, by predisposing to tetany. In secondary cataract the diminished flow is due to inflammatory products surrounding the lens. And finally, in senile cataract it is the result of the general diminution of the bulk of the nutritive fluids in old age.

One might have thought that the increase in bulk of the lens, which Priestley Smith has shown to occur at a certain period in the development of cataract, would prove a difficulty in the way of the theory of its causation here advanced. But the author does not find it so. The contracting nucleus, he says, causes separation of the fibres of the cortex ; the spaces thus formed are filled up by the drawing-in of fluids from outside, and hence the whole bulk of the lens is increased. And when he further suggests that the bundles of fibres, which have been referred to as lying torn across on the surface of the cortex of the senile cataracts, have been rent asunder by the equatorial pull of the contracting central portions of the lens (the possibility of the rupture having been produced during the extraction of the lens in its capsule being mentioned only to be dismissed), one is inclined to ask if the author does not carry his belief in the powers of the "shrinking nucleus" somewhat too far.

W. G. Laws.

KATZ (Heidelberg). A Case of Plexiform Neuroma of the Orbit and Upper Eyelid. *Arch. f. Ophthal., xlv.*, 1, *March*, 1898.

The case reported by Katz (from the University Clinique, Heidelberg) is, according to the list given by him, the twelfth recorded instance of this form of tumour involving the orbit and eyelid. The first was published by Billroth in 1863.

Katz's patient was a girl, aged 12. When 3 years of age she fell downstairs, striking the right side of her head. Soon after the fall a small, hard swelling developed in the right upper eyelid, gradually increasing till the whole lid was much thickened. Six years and four-and-a-half years before the child came under Katz's notice, operative measures had been adopted, but without material improvement in the deformity.

On admission, there was considerable thickening of the right upper lid, which drooped, but could with an effort be raised so as to expose the pupil. There was slight eversion of the lid margin; no abnormal development of lashes. The lower lid was normal.

On everting the upper lid, the palpebral conjunctiva was found to be hypertrophied over its whole extent. About 4 mm. from the free border was a deep, horizontal scar. No positive diagnosis was made, and the true nature of the case was only discovered when an operation was undertaken. On removal of a portion of the conjunctiva of the upper lid, including part of the retrotarsal fold, it was obvious that there was but little thickening of the conjunctiva; in the subjacent tissue were numerous yellowish spiral strands. These were easily pulled forwards and cut away; the orbital fat then protruded, and it was thought advisable to desist from further measures through this incision. Another piece was removed through a lateral incision. The wounds healed by primary union; the result, as far as the thickening of the lid was concerned, was satisfactory, but the ptosis remained practically unaltered.

Five months later another operation was undertaken for the relief of the ptosis, and on cutting down upon the upper margin of the tarsus, a large mass of a similar plexiform growth was discovered. This was all removed, after division of the tarso-orbital fascia, and the operation completed. The result as regards the ptosis was unsatisfactory. The patient was not seen again, and was accidentally drowned some time afterwards.

The portions of growth removed were hardened in Müller's fluid, and subsequently in osmic acid solution. The naked-eye appearances of the growth were those of a knotted, twisted, plexiform tissue; two main cords were distinguishable, the diameter of which varied very much, giving them a varicose appearance, as shown in one of the author's illustrations.

After hardening, the spiral cords became more distinct, the scanty supporting tissue having shrunken. On the larger strands a fibrous sheath could be distinguished, and in places, where divided, this had retracted, exposing a grey substance, in the bony axis of which was a darker band, stained deeply with osmic acid.

*Microscopic examination.*—Beneath the thickened skin was a very vascular connective tissue layer, in which were bundles of nerve-fibres very irregularly disposed, running transversely, longitudinally, or obliquely, and enclosed by concentrically arranged connective tissue. In the superficial portion of the growth there were also single nerve fibres, with thickened sheaths; these were most numerous in the deeper part of the growth.

No constant relation existed between the number of nerve fibres and the amount of supporting tissue. Degenerative changes were present in the nervous elements, in the large and small bundles of fibres and in single fibres. These changes were met with in places where there was abundant connective tissue round the nerves and also where this tissue was scanty.

In some nerve fibres in the growth, Ranvier's nodes were plainly visible; the diameter of the fibres was very varied, and in many, spindle-shaped and varicose swellings were

found. In some the medullary sheath was successfully stained, but in others it was so degenerate that it could not be stained. The writer thinks that the concentrically arranged connective tissue may be the remains of bundles of nerve fibres, the nervous elements having disappeared.

In most of the recorded instances of plexiform neuroma, many of the fibres have shown marked evidences of degeneration, but as to the cause of this opinions are diverse.

Katz's paper is illustrated by three figures, one of the appearances of the child's eyelids, one of the naked-eye characters of the portion of growth removed and one of a microscopic section of the tumour.

J. B. L.

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ELSCHNIG (Vienna). Ocular Palsies through Metastatic Tumours. *Wiener Klin. Wochenschrift*, No. 5, 1898.

Elschnig reports two cases of paralyses of ocular muscles through metastatic carcinomata. The first occurred in a woman, aged 73, affected with uterine carcinoma. Numerous firm nodules from the size of a pea to that of a hazel nut were scattered throughout the integument. The left eye protruded slightly—the proptosis being about half a centimetre—and could not be returned by pressure. Ptosis and slight disturbance of motility were also present. The motor disturbance progressed to almost complete immobility; corneal anæsthesia and neuro-paralytic keratitis supervened. The pupil was equal to that of the other eye and reacted well to light. Ophthalmoscopic appearances were normal, and no orbital tumour was perceptible. The *post-mortem* examination showed metastases in the retroperitoneal lymphatics, skin and right mamma. The brain was unaffected.

In the left orbit the orbital fat was unchanged. Metastatic tumours were found in all of the ocular muscles except the inferior oblique. Each of the muscles arising

at the apex of the orbit presented at its immediate origin a single (the superior oblique, a second also) spindle-shaped, firm nodule, involving the entire thickness of the muscle. Microscopic examination showed these nodules to be carcinomata. The numerous nerve fibres imbedded in the tumour tissue were completely or almost completely degenerated.

The situation of the tumours at the origin of the muscles raises the question whether the paralysis was of nervous or directly muscular origin, *i.e.*, from pressure upon the motor nerves before their entrance into the muscles, or through mechanical interference with the muscular contraction and interruption of the nerve currents in the muscles themselves. Consideration of the anatomical conditions at the apex of the orbital funnel will simplify the solution of this question. All the nerves entering the orbit, except the optic, traverse the superior orbital fissure, which is converted into narrow channels for the passage of nerves and the ophthalmic vein by connective tissue arising from the periosteum and *dura mater*. Partly from this tense connective tissue, and partly from the bony walls of these canals arise the recti (their united tendons forming a closed pyramid), the elevator of the upper lid and the superior oblique. Any new formation, even a small one in this narrow space, formed by the muscles and the bony walls of the orbit must necessarily exercise pressure upon the structures there situated, and may at a very early stage lead to pressure paralysis of the nerves traversing this region. The anæsthesia present in this case must be supposed to have been caused in this way, *i.e.*, by pressure upon the ophthalmic branch of the trigeminus.

The metastatic nodules at the origins of the muscles may also have affected the motor nerve in the same way; nevertheless, Elschnig regards it as more probable that the ocular palsies were mostly of direct muscular origin, for the reason that the pupillary fibres of the oculo-motor were intact, the pupil of normal size and reacting to light. The fact that small tumours at the points of origin of most of the ocular muscles must cause paralysis of the same is

evident likewise from their mode of innervation. The nerves intended for the innervation of the ocular muscles arising at the apex of the orbit gain almost immediately after their entrance into the orbit the inner surface of their respective muscles and thence radiate, fan-shaped, into the muscular substances. That the metastatic nodules did in fact cause paralysis through a direct effect upon the nerves is shown by the atrophic condition of the nerve fibres imbedded in the nodules.

Metastatic tumours are uncommon in muscles generally; metastatic tumours in the ocular muscles are rare — in fact, but a single case has been observed and reported (by Horner), and this loses in interest from the fact that the tumour was not the cause of the paralysis, which was due to a neoplasm at the base of the skull. The patient had severe headache and paralysis of the external muscles innervated by the oculo-motor nerve (the internal escaped). Complete immobility, with increasing exophthalmos, dilatation of the pupil and almost complete blindness supervened. At the *post mortem* there was found carcinoma of the sphenoid with carcinomatous nodules the size of a cherry in the external ocular muscles (with the exception of the two obliques). Numerous metastases were present in various other organs. The nodules in the ocular muscles were probably the cause of the increasing proptosis, but not of the disturbed motility (according to Horner), which was due to the neoplasm at the base.

Meigs and de Schweinitz describe a metastatic sarcoma of the brain (from a round-celled sarcoma of the mediastinum), which appeared to have extended along the nerves into the orbit and thence to the muscles. The extension of neoplasms of the orbit to the muscles is also of exceptional occurrence. The ocular muscles as a rule are like the optic nerve in this respect, *i.e.*, they become closely enveloped by the tumours but are not involved in them. It may be added that primary neoplasms of the ocular muscles are also extremely rare.

The second case is one of total ophthalmoplegia of the left eye through metastatic carcinoma of the left cavernous sinus.

Diseases of the cavernous sinus are clinically interesting in several respects from the fact that all the vessels and nerves of the eye are intimately connected with the same. The internal carotid, after leaving the carotid canal before reaching the base of the skull, traverses the cavernous sinus, and there gives off the ophthalmic artery at the point where it makes its last and most acute bend. The ophthalmic vein empties into the cavernous sinus. All the motor nerves, as well as the sensory nerves of the orbit, traverse it before they enter the orbit, being either imbedded in its innermost walls or perforating it directly, like the abducens. Finally, the sympathetic roots of the ciliary ganglion accompany the carotid plexus through the same sinus, and so reach the base of the skull.

The most striking symptom, accordingly, of pathological changes in the sinus is paralysis of the ocular muscles. It is well known that diseases at the base of the skull, tumours and inflammatory processes, which extend to the cavernous sinus, menace the motor nerves of the eye. Thrombosis of the sinus has been known to cause palsies of the ocular muscles. Elschnig is unaware of any case of primary tumour of the cavernous sinus, and for this reason alone the case in question is of interest.

A man, aged 47, suffered from ptosis of the left eye about five weeks before his death, with complete paralysis of the external and internal ocular muscles, and anæsthesia. The ophthalmoscopic appearances and visual acuity were normal, and there was no exophthalmos. There was pain in the left upper teeth, and a rapidly growing tumour of the thyroid.

The autopsy showed carcinoma of the thyroid with perforation into the right jugular vein, thrombosis of the right pulmonary vein, and metastatic growth in the left cavernous sinus, compressing the cerebral nerves emerging in this locality.

The unusual situation of the metastatic carcinoma is probably explicable by the perforation of the primary neoplasm into the right jugular vein; the lumen of the latter was probably largely obstructed (partly by the sur-

rounding growth, partly by the penetrating neoplasm), leading to vortical movements of the blood, detachment of tumour particles during coughing, &c. The latter being carried to the cerebral sinuses and arrested in the cavernous sinus, we may regard the metastasis as of direct hematogenous origin. The neoplasm developing in the sinus would evidently lead to pressure paralysis of the cerebral nerves traversing the sinus or its walls, and thus lead to anæsthesia in the region of the first branch of the trigeminus, with pain radiating into the parts supplied by the other branches, and total ophthalmoplegia. Microscopic examination showed that the paralysis was not due to atrophy from pressure but to interstitial neuritis—a fact easily comprehended since it is well known that inflammatory symptoms are rarely absent in the neighbourhood of carcinomata.

It is worth noting that in obstruction of the cavernous sinus through neoplasm or thrombosis, dilatation of the superficial veins of the eye-ball, or of those of the retina, is not to be expected. Sesemann had already shown that the ophthalmic vein is connected with the veins of the face by such large and numerous anastomoses that (in view of its lack of valves) the blood may normally flow from the cavernous sinus into the ophthalmic vein.

Elschnig's own observations have convinced him of the mistake of the view, still largely held, that simple thrombosis is capable of causing congestive phenomena in the orbital structures, exophthalmos, chemosis, &c. These phenomena are symptoms of a thrombo-phlebitis (septic thrombosis) of the cavernous sinus which has extended to the orbital veins; and which occurs especially, and not very rarely, as a complication in purulent inflammation of the middle ear.

T. B. Schneideman.

S. C. AYRES (Cincinnati). Sympathetic Ophthalmia. Rapid Failure of Vision in Injured and Sympathising Eye. Improvement after Enucleation, with Subsequent Relapse and Final Partial Restoration of Vision. Histological Examination of the Eye by Adolf Alt. *American Journal of Ophthalmology, February*, 1898.

The course of the case is indicated in the heading, and we need make no more than a very brief farther reference to it. The point of interest lies in the subsequent histological examination by Alt.

Gladys K., aged 7, injured her left eye with a knife blade, ten weeks before she was seen by Ayres. There was no irritation of the other eye till seven weeks after the accident, while the irritation was only slight until within a week of the time when she was brought for advice.

The wound of the left eye had healed with incarceration of the iris. Its vision was fingers at 6 feet. The right (sympathising) eye was injected, markedly photophobic, the iris looked nearly normal but the pupil was rigid and did not dilate even after the frequent use of strong atropine, V = fingers at 20 feet. The mother would not consent to removal of the injured eye till two days later, when its sight had sunk to bare hand reflex, and that of the other to fingers at 3 feet.

Five days after the enucleation of the right the child could count fingers at 15 feet, and there was much less photophobia. Again, ten days later, vision was equal to fingers at 24 feet, but unfortunately she gave her eye at this time a slight blow, and it at once became irritable and inflamed, with a corresponding decrease in its visual acuity. The acute condition slowly passed off, and from being unable to recognise objects close to her, she recovered sight enough to count fingers at 2 feet. When Ayres last saw her there was a red reflex from the fundus, the eye was quiet with normal tension, and the condition generally a good deal improved.

Alt gives a full description of the right eye, which he

examined microscopically. We append an abstract of his report.

Macroscopic examination showed an anterior synechia near the corneo-scleral junction. The vitreous was stained with blood pigment; there was a peripheral retinal detachment and swelling of the papilla. No sign of cyclitic membrane. The lens seemed more spherical than normally it should be; the iris was adherent to the anterior lens capsule, except at the site of the anterior synechia.

Microscopically the eye was examined throughout, the sections being, some meridianal, some æquatorial, so as to ensure thorough investigation.

There is a slight infiltration of the corneal tissue with round cells, but nothing beyond this except at the site of the anterior synechia, where the iris and part of the ciliary body are dragged into the wound and have become firmly adherent to the cornea. There is some new formation of blood vessels and much round cell infiltration at this part.

The iris tissue is throughout filled with round cells, and here and there they are so dense as to form little tubercle-like masses. The only blood vessels visible are near its surface, and these are empty, and show perivasculitis. The pigment of the iris tissue proper has disappeared, and there only remain traces of the sphincter. Round cells cover the anterior surface of the iris. An interesting change has occurred at the posterior iritic surface, where a layer of small cavities, divided from one another by pigmented trabeculæ separates the uveal pigment from the iris tissue. There are some round cells in these cavities, and the "trabeculæ are formed by the stretched and distorted cells of the layer of pigmented spindle cells, which by some are considered to be the dilator muscle of the iris." Alt thinks that possibly the larger cysts on the posterior surface of the iris, which have been described by Treacher Collins and some others, may be formed by the confluence of smaller cavities such as are here present.

The posterior surface of the iris is in parts glued to the anterior lens capsule by an intervening fibrinous substance

which is filled with round cells. The ciliary body also is so completely filled with round cells that it is hardly possible to recognise its proper structure. Choroid and retina are similarly infiltrated and the infiltration of the latter, which is especially affected in its nerve fibre layer becomes more dense towards the optic nerve entrance. Numerous very minute detachments of the retina from the pigment epithelium can be made out, and near the disc the internal limiting membrane is largely detached and pulled into the interior of the eye. There is much swelling of the optic disc and the nerve is choked with round cells. These also are very abundant in the pia mater, as far as it reaches, but less numerous in the dura mater sheath. The ciliary nerves, in their passage through the sclerotic, are filled with round cells.

As the case was so recent and the sympathetic nature of the inflammation in the fellow eye so undoubted, Alt was hopeful of finding micro-organisms in the tissues of the eye he examined. This hope, moreover, was strengthened by the character of the round-celled inflammation, resembling, especially in its tubercle-like aggregations, a microbic inflammation.

Numerous sections accordingly were stained in various ways, but all to no purpose. Hunt as he would, Alt could find no bacteria. "His disappointment," he says, "was as great as his search for the micro-organisms was ardent."

If, as is probable, the severe inflammation of the uveal tract in this eye was caused by a microbic infection, the organisms, Alt thinks, have either wandered beyond their original seat of mischief, or they have been killed in the very tissues which they stirred up to such acute inflammation.

N. M. ML.

## COLLEGE OF PHYSICIANS OF PHILADELPHIA, OPHTHALMOLOGICAL SECTION.

GEORGE C. HARLAN, M.D., in the Chair.

TUESDAY, MARCH 15, 1898.

Dr. G. C. Harlan's second case of *Kerato-globus*, a sister of the case shown at the February meeting, presented many features similar to it: globular distension and perfect transparency of both corneæ; deep anterior chambers; oscillating irides; lenses present; hyperopia of 5 D. and no cupping of discs. The horizontal diameter of each cornea is 14 mm. and of each ball at the equator 24 mm.; the pupils are only 1 mm. and under atropine $2\frac{1}{2}$ mm. During the past two months the vision had been failing and the fields are decidedly limited. The optic discs, examined with difficulty on account of the small pupils, appear dull and grey and the retinal veins engorged. The lowered vision is accounted for by the condition of the nerves and is independent of the kerato-globus. The parents and three children of the patient have no unusual ocular condition. The occurrence of this anomaly in two members of a family confirms the view of its congenital origin.

Dr. Edward Jackson found the curvature of the corneæ to be uniform almost to the scleral junction, and that the lenses were present but displaced slightly downward.

Dr. W. F. Norris believed the right lens was present, but in the left eye its presence was doubtful. The patient was probably suffering from progressive optic neuritis.

Dr. Edward Jackson showed a case of *Anomaly of the Iris.* A man, aged 69, had good sight until nine years before, when he had severe pain in the right eye and whole right side of the head. This eye now presents high irregular astigmatism and a pale optic disc; V. $\frac{2}{40}$.

The left eye had continued good until four years ago, when vision became impaired without pain or inflammation. There was a nebula of the outer portion of the cornea; some opacity of the lens; and the iris at its upper, inner portion exhibited a small area entirely devoid of pigment, through which the fundus reflex was obtained. In this direction also there was an entire absence of the

sphincter of the pupil. Other portions of the pupillary margin reacted to light, but this remained fixed. The pupil and iris of the right eye were normal. Patient denied all history of injury or inflammation in the left eye, and was positive this had remained good after the right eye had been impaired.

Dr. Charles L. Leonard, by invitation, exhibited and described his apparatus designed for the localisation of foreign bodies within the cranium and orbit. It consists of a yoke that can be firmly fastened to the patient's shoulders; adjustable upon this yoke is an upright frame which supports the plates, and to which the patient's head is firmly fastened by bands during the entire series of observations. Rigidly connected with this, but adjustable at any angle, in a plane perpendicular to the photographic plates, is an arm which carries the X-ray tube. The relational angle can always be read from a divided arc situated at the articulation.

The apices of these angles are marked upon the skin, and shown upon the photographic plates by two lead ferrules, which are always placed upon the margins of the plates, and do not, therefore, cast their shadows in the field of observation. They slide upon an aluminum wire permanently placed upon the upright frame.

The tube, foreign body, and plates are, therefore, held in a known, rigid relation to each other and the known point; while a series of observations is made, which give the data from which their mutual relation may be mathematically determined, or may be accurately measured by the graphic method.

The sources of error common to other methods, but avoided by this rigid apparatus fixed to the patient, are, changes in the relation of the tube, foreign body, known point, and plates by unconscious motion of the patient or during the interchange of plates. An additional advantage is the absence of all foreign bodies from the field of observation.

The X-ray "burn" is not due to the X-ray, but to the static electric charge induced in the tissues of the patient by the high potential induction field surrounding the tube. It is never serious, and may be prevented by introducing

a "grounded" aluminium conductor as a shield between the tube and the patient.

Dr. Howard F. Hansell reported a case of diagnosis of the presence of a piece of steel in the left eye by the X-rays, and its localisation by the method of Dr. Wm. Sweet. It was extracted from its site under the lower periphery of the lens after iridectomy, by the medium-sized curved tip of the Hirschberg magnet. It weighed 9·5 mg. and measured $4 \times 2 \times \frac{9}{10}$ mm. The eye recovered perfectly from the injury, although vision is reduced to the perception of large objects on account of blood in the vitreous chamber. The X-ray plates, so valuable in the treatment of the injury, unexpectedly revealed the presence of another fragment of steel in the orbit near the outer angle, of which no history whatever could be obtained. The only plausible explanation of its presence was that it entered contemporaneously with the other injury. Against this supposition, however, is the absence of any external wound, of hæmorrhage, of bruise or contusion of the tissues, and that the second fragment was found after removal to consist of steel of a different character and quality from the other. With the aid of the magnet it was easily excised and its dimensions were found to be $6 \times 1 \times \frac{1}{4}$ mm. and its weight 23·5 mg.

Dr. Wm. M. Sweet reported, by invitation, the results of his experience in the localisation of foreign bodies in the eyeball by his apparatus. The various methods that have been employed resolve themselves into a determination of the angle of the X-ray tube with the foreign body and with one or more dense objects situated near the eyeball. Approximate results have been obtained from a study of the shadow of the foreign body in relation to the shadows of the orbital bones, but owing to the variations in the position of the eyeball, which have been shown by the investigations of Cohen to amount in healthy individuals to as much as 10 mm. behind the edge of the orbit and 12 mm. in front of the same, this method does not equal the accuracy possible by other means. Whatever form of indicating object is used in working out the position of the foreign body, certain factors are essential to accurate

results : (1) A tube should be used which may be run at high vacuum, in order that the rays may readily penetrate the bones of the head. (2) The patient should be in the recumbent posture to ensure steadiness of the head and body. (3) The visual axis should be parallel with the plane of the plate at the side of the head, or, if it deviates, the angle should be measured and allowed for in the determinations. (4) The situation of the indicating objects with respect to the centre of the cornea in each individual case should be known, otherwise the determination of the location of the foreign body will vary with the varying situation of the eyeball in the orbit in different persons. (5) The angle of the tube with the indicating objects must be accurately measured. The two indicators being parallel with each other and with the plate, the distance the shadow of one of the balls is posterior to that of the other is the measure of the distance that the source of the X-rays is carried to the front.

The method has been employed in a number of cases of suspected foreign bodies in the eyeball and orbit, in seven of which the shadows of the bodies were obtained on the plate, and their position indicated. Three of the cases were gunshot injuries, in which the findings were not verified by subsequent operation. One case sent by Dr. de Schweinitz had one shot located in the left eye and one in the right orbit outside of the eyeball. Two cases of gunshot injury were skiagraphed for Dr. Hansell, in one of which the shot was located at the apex of the orbit, and in the other patient the positions of several shot were indicated, one in the eyeball, one in the orbit beneath the superior orbital ridge, and one in each nasal cavity. Recently he made several radiographs of a patient for Dr. de Schweinitz, in which the piece of metal was located in the lower nasal portion of the sclera. Certain clinical signs appeared to indicate that the determination made was correct.

An apparatus to accommodate a larger plate had been constructed upon the same principle, which may be employed for locating foreign substances in the head or any other part of the body.

Dr. A. G. Thomson had had frequent opportunities of studying Dr. Sweet's method and had found it precise and practical. In reference to the burns from X-rays, he believed that the practical advantages gained by the X-rays far outweighed the deleterious effects produced by them.

Dr. Leonard employed an exposure varying from five to ten minutes with the tube at a distance of eighteen to twenty inches. He preferred this distance, because the relation of any error, produced by unconscious movement of the eyeball to these greater factors in the calculation was almost without effect upon the final result, while in methods in which the calculations were based entirely on shorter measurements, with the fixed point on the eyeball, not only the foreign body, but also the fixed point would be moved, doubling the amount of error made, while the short distance of the measurements made the error produce a greater effect upon the final result. He followed numerous other observers in preferring to keep the patient's eyes closed during the observation, the visual axis being readily determined by observing the prominence of the cornea through the closed eyelid.

Dr. W. M. Sweet, while acknowledging the possibility of error from movements of the eyeball during the exposure, stated that he had found no difficulty in having the patient steadily fix an object during the short time now required in making the radiographs. With the eyelids closed as suggested by Dr. Leonard there was no means of determining the visual axis, an important factor in accurate work. It is not alone necessary to state the distance the body is from a fixed point at the side of the head. The surgeon to successfully remove the body must know the relation which this spot bears to the structures of the eyeball. A body located a certain distance from a fixed point of the apparatus might be inside the globe in adduction, and outside the orbit in abduction. There must exist a factor of uncertainty in any determination of the position of a foreign body in the eye that fails to take into account the relation of the axis of the globe with the photographic plate and the indicating objects, and also the varying position of the eyeball in different individuals with respect to the external orbital angle.

# NOTES ON SOME FORMS OF CONGENITAL CATARACT.

By Donald Gunn.

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I think it worth while to record these few cases of congenital cataract, not on account of any special novelty they possess, nor that I have anything to say that will materially help towards a classification of the subject as a whole (though it seems to me that such a classification is much wanted), but because in some of them I have been at a loss to decide the exact nature of the defect present, and in others the results of operating have been anything but satisfactory.

The subject of congenital cataract and its varieties is one that receives only the briefest treatment in most of the books with which I am familiar, some authors being content with the bare mention that children are sometimes born with opaque lenses and others only referring to it in passing as one of the forms of soft cataract, so that the impression apt to be received from books is that, apart from zonular opacities, the common form of congenital cataract is a uniformly opaque lens much like the senile form, except that (owing to the youth of the patient) the lens is soft instead of hard.

I have no wish to dogmatise from my limited experience, but I can only say that I have seldom met

with cataracts of this description. It is more common, I think, to find the cataracts departing from this type usually in the direction of the lenses being much beneath the normal size. It is therefore this group of shrunken cataracts to which I wish to refer particularly as being the most difficult to explain, the most likely to lead to an error in diagnosis, and the most unsatisfactory to treat.

In the first vol. of Norris's "System of Diseases of the Eye," where there is a more detailed notice of the subject than in most of the ordinary text-books, congenital cataracts are grouped into those in which the opacity extends throughout the lens, and those in which only a portion of the lens is opaque. The complete form is subdivided into three classes according to their consistency—(1) those in which the cataract is quite fluid; (2) cases in which the lens presents a milky white uniform opacity, but retains more or less its normal consistency; (3) cases in which the opacity is densely white, and where the lens is *apparently* shrunken and flattened. That the authors do not regard them as being really so I gather from the explanation of the condition which they offer, namely, that it is secondary to a persistence and thickening of the posterior fibro-vascular sheath which remains after discission and cannot be acted on by the aqueous. Now if I have read this rightly, it does not include the cases of really shrunken lenses at all, for in them there is no true lens substance to be acted upon by the aqueous, nor, when the small central opacity is removed, do they (in my experience) show any indication of persistent fibro-vascular sheath or thickened vitreous.

Fuchs, in his text-book, dismisses congenital cataract in a few lines. After saying that it may be due to arrest of development or intra-uterine inflammation of the eye, he adds, "not a few congenital

cataracts are complicated, as can be seen from the changes found at the same time in the iris, especially posterior synechiæ. They are the result of fœtal iritis. The formation of the cataract must in many cases be dated pretty far back in intra-uterine life, since children are sometimes born with cataracts that have already become shrivelled. Here, therefore, the entire process of ripening and of shrivelling has been evolved in utero."

Briefly, then, the two theories available are :—(1) that congenital cataracts of this class are due to perverted development resulting in the laying down of tissues deviating more or less from normal lens structure ; (2) interference with the nutrition of a growing lens by some inflammatory process (such as iritis or cyclitis) resulting in degenerative changes in the direction of softening, and more or less complete absorption. That my bias is in favour of the latter as a working theory is evident from the fact that I have classed these lenses as *shrunken*.

Collateral evidence in support of either view, such as the presence of other congenital ocular malformations on the one hand, or of traces of past inflammation about the iris on the other, is seldom forthcoming. Among healthy infants an incomplete reaction of the pupil to atropine is of too common occurrence to make its presence of any value in estimating the probability of a past iritis.

Inherited syphilis is, I suppose, the common, if not the only cause of intra-uterine iritis, and if a large percentage of congenital cataract patients showed evidence of this disease the probability of the cataracts being due to a syphilitic inflammation would be much strengthened in spite of the absence of posterior synechiæ. In most of my cases there has been little or no suspicion of syphilis, but in a few there was no doubt of its presence ; in these latter, however, the

lenses, though opaque, appeared to be of full size, but as every opaque lens is, I suppose, potentially a shrunken lens, they may in reality fall under the same heading as the shrunken ones. Concurrent syphilitic disease of other organs has, in some of my cases, caused death, and in others has rendered operation inadvisable up to the present time. I must, therefore, wait for a more extended experience before offering any decided opinion on this point.

These shrunken cataracts are familiar to every ophthalmic surgeon, and I should like to know the results of operating upon them in the experience of others, as from what I have seen I cannot think that results as unsatisfactory as some of those I have to relate are at all common. When I speak of unsatisfactory results, I do not mean that I failed to give my patients perfect vision, but that as the result of my earlier operations several eyes were lost altogether. Subsequently I took to doing a preliminary iridectomy. My reason for this was mainly that I might be able to judge better of the condition of the lens, for as in most of these cases the reaction of the pupil to atropine is very incomplete, I thought that through the coloboma I should at any rate be able to gauge the size of the lens with which I had to deal.

As a result of this step in certain eyes in which I felt sure I had to deal with a lens shrunken almost to vanishing point, I was much perplexed to find in the coloboma what appeared to be the edge of a full-sized lens in its normal position. Ultimately the real state of affairs proved to be this. The lens had, as I suspected, shrunk down to a tiny calcareous wafer, but the capsule, instead of sharing in its contraction, had remained in its place, only collapsing antero-posteriorly, so that to focal and transmitted light it gave almost the appearance of a full-sized clear lens having a star-shaped opacity somewhere in front of its posterior

pole. I say *almost the appearance*, for the want of roundness about the edge of the supposed lens showed its true nature, especially on using the ophthalmoscope when the normal black line was wanting.

Whether, as I have suggested, the contraction of the lens took place relatively to the capsule, or whether the lens having suffered as a whole when still very small, the capsule had subsequently continued to take part in the expansion of the eye by the traction exercised on it by the suspensory ligament, I do not know; possibly both processes occurred, and certainly the latter, for the edge of the capsule still occupied its normal position in one of the cases when last examined (the child being then 3 years old) though the cataract was present at or soon after birth.

Another interesting though still more inexplicable group of cases is that in which a congenital opacity is present in the lens of one eye only. I have notes of one such case, but in it the lens, in addition to its cataractous condition, was of an unusual formation.

*Congenitally Shrunken Lenses simulating Polar Opacities in a child whose mother had Cataracts of the same kind, and who was also a Heredito-syphilitic.*—Dorothy K., 1 year and 10 months.

The *mother* is the youngest of four girls, all living; the others have good sight, but one has been deaf since childhood. There was an interval of eight years between her birth and that of the previous child; she does not know that her mother had any miscarriages. She was always a delicate child, and blind till the eyes were operated on when she was an infant. She is probably of weak intellect, has an earthy wrinkled skin, and teeth are typically Hutchinsonian; has been married three years; only one pregnancy. She has nystagmus, a convergent squint, and the eyes are microphthalmic; has had double iridectomies done in each eye (inwards and outwards) and wears + 13D. The left pupil and colobomata are filled by a densely pigmented membrane, the fundus reflex being

obtained only through a narrow chink in the outer part of this. The right eye shows a similar but smaller pigmented plug which probably represents the remains of the lens. I imagine that she has had needling done as well as the iridectomies, but her hospital letter does not give much information.

The *child* is certainly rickety, but nobody will give a decided opinion that she is syphilitic. There is the usual history of thrush and snuffles, but not definite enough to be worth anything. One or two small cicatrices on the loins might be the result of chicken-pox. She is well-formed and very intelligent, taking the keenest interest in any glittering object. The eyes are well formed, not small like the mother's, and the corneæ are clear. No history of ophthalmia neonatorum. The pupils are circular, but do not react to light, and very little, if at all, to atropine; but there are no obvious posterior synechiæ. Occupying, though not quite filling, each pupil is a circular opacity, consisting of a chalky spot which is quite superficial, backed by a less dense plaque, of which the rim is the most opaque part; this, the larger portion, is about 3·5 mm. in diameter.

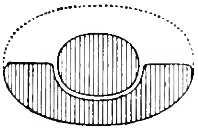
I did an iridectomy in each eye, and a few months later made an incision with a bent broad needle and drew out the opacity from each with forceps. There was no difficulty about this, the shrivelled remains of the lens forming an elastic disc, which came away with a minimum of traction "like an empty grape skin." It was not calcareous to the touch.

The effect of the operations was to improve the child's vision in a most noticeable way, and when she was 3 years old I ordered + 11D. The nystagmus then had lessened, and the fundus appeared to be quite healthy.

*One-Eyed Cataract of Unusual Form.*—Ethel H., aged 5 months. The mother had noticed "dimness" of one eye a fortnight previously. No family history of cataracts. Patient is the first child and quite healthy, having had no illness. *No history of injury* or convulsions. The left eye, which diverges somewhat, has an opaque lens, but other-

wise appears normal. The pupil is circular and dilates well to atropine, showing a grey fairly uniform cataract. No scar in cornea or anterior capsule.

Three years later I operated. In the interval the appearance of the left lens had not altered in any way. Another child born last year (a boy) has perfect eyes. When about to operate by needling I found that the lens consisted of two parts, each opaque and apparently enclosed in its own capsule. The anterior and central part appeared to be an opaque nucleus (shaped like a lens). This was backed up by another much larger circular opacity, which corresponded to the posterior cortex, so that it seemed to be a cataractous lens with a well differentiated nucleus in which the whole of the anterior cortex was wanting.



When I touched this central lens-shaped part I found that it was elastic and altered shape readily under the slightest pressure, and that it was freely movable on the part I have called the posterior cortex. This seemed to me a very interesting condition, so without having wounded the lens capsule I withdrew the needle and did an iridectomy. I made a note at the time of the possibility of this being a small opaque lens backed by a persistent fibro-vascular sheath.

Subsequent examination through the coloboma showed the difference between the two parts of the lens very plainly, and the rough diagram I made will give an idea of the condition as I imagined it.

My next step was an attempt to remove the lens. On touching the posterior part with the cystotome it ruptured and the contents, which were quite fluid, escaped, leaving

the anterior portion (the nucleus) intact. This in turn was ruptured and the contents escaped, though they were not so fluid as the other part; the capsule of the nucleus remained, filling the pupil. On attempting to remove this with cross action forceps there was some escape of vitreous, probably due to rupture of the hyaloid by the heel of the forceps.

The eye healed readily and the A. C. reformed, but three weeks afterwards the eye was noted as pink, and three months later the tension had fallen, and the eye remaining irritable I excised it.

*Shrunken Lenses. In one eye Needling, followed by Acute Glaucoma; in the other Iridectomy.*—Florence G., aged 8 months, is the second child; the other, a boy, I have also examined; he has perfect eyes. When one month old she "screamed night and day," but there were no convulsions. Never any skin eruption or thrush. There seems to have been some suspicion of syphilis, for an out-patient letter bore a diagnosis of congenital syphilis; but I could not trace the diagnosis to anybody in particular, and Dr. Batten, who examined the child subsequently, said there was nothing to make him suspect it.

The child, who is preposterously fat, has a rolling nystagmus; this has been present since 1 month old. There is convergent squint. Structure of iris appears normal, but pupils do not dilate more than half, if as much, to atropine. Cataracts are central, roughly circular, and chalky looking, situated some way behind the plane of the iris, and probably consist only of remains of lenses. I may say that on using atropine the child at once became much flushed, restless, and the tongue rapidly dried. This condition persisted for a day or two, and the mother had to call in a doctor.

A few months later I needled the right eye; the child again showed symptoms of atropine poisoning within half an hour of the drops being used. My note of the operation says: "Opacity very hard; evidently no lens present except the chalky mass, which was slowly picked to pieces

with the needle till it showed a clear opening in centre. This took some time, both on account of hardness of the opacity and the elasticity of the surrounding membrane and suspensory ligament. The chalky chips probably went backwards behind the iris. That night the temperature ran up to 106°, and for the four days following reached 104°. Unfortunately I was not informed of this, and it was only on the fourth day when I went to see the patient that I learned the state of affairs. I then found the child looking very ill, with a dusky injected eye and a tension of + 2 or more. The A. C. was deep and the aqueous clear. There was no suspicion of any infection of the needle puncture and the iris was of good colour, though decidedly *bombé*, and therefore obviously adherent by its pupillary margin to something; not to the opacity, for the remains of that could be seen at a deeper level than the iris and well within the pupillary area; it also looked exactly as it had when I finished my operation, so that a swelling lens could be excluded. I did an iridectomy and the temperature fell to 101°, and two days later was normal; but the pupils became filled with lymph and drawn up, the tension fell and the eye slowly shrank.

Some months later the child was re-admitted, and after the temperature had been observed for some days atropine was used to see if this had possibly been the cause of the high fever, but beyond a little flushing there was no reaction. I then did an iridectomy on the remaining eye, and after doing so, what appeared to be the edge of a full-sized lens in its normal position could be seen in the coloboma. This obviously made my diagnosis of shrunken lens untenable, and I remained in doubt till the birth of another child, with exactly similar cataracts, enabled me to determine the true condition.[1] This spring my patient was admitted into Queen's Square Hospital under Dr. Buzzard for fits; she had as many as twenty-four in one day, and is now certainly nearly idiotic.

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[1] See next case.

*Congenitally Shrunken Lenses. Iridectomies. Needling.*—Beatrice G., 12 months. In this child the opacities are of much the same kind as in the sister and are placed behind the plane of the iris, but probably somewhat in front of the position the posterior pole of the lens should occupy. The iris is not tremulous and its structure is normal. The pupils under atropine are circular and about 4·8 mm. in diameter, the opacity being about 3·5 mm.

Before operating, atropine was used; she became very rapidly flushed and temperature rose from normal to 101°. In the subsequent course of the case, however, I could not make out any direct relation between the rises of temperature which frequently occurred and the use of atropine.

I did iridectomies and later examined the lenses through the colobomata. My note made at the time is: "There is no doubt that far out in the coloboma is a curved line having all the appearance of the edge of a lens, except that it is not rounded enough, *i.e.*, it is too thin, as though it were the edge of a clear capsule held out in position by the suspensory ligament but not containing the normal amount of (if any) lens substance. The central opacity, when seen through a lens, consists of a semi-transparent disc having at its centre a dense rosette composed of white lanciolate elements (a dozen or more) which are attached at one end to a common nucleus and project in various directions like a sea anemone or a wedding favour."

The right opacity I divided with two needles and it subsequently diminished in size very much, leaving a good opening. In the left eye I cut round the opacity for some distance and made a gap in the capsule below it. No swelling of lens in either. This child, like the other, is absurdly fat, and is, as the mother puts it, "not all there." So far she has had no fits.

*Shrunken (or Ill-developed) Cataractous Lenses.*—Ernest L., 11 months, is the youngest of four, all boys, the others have perfect sight and are quite healthy (I examined them all). Patient was healthy till 6 months old, when he had

a succession of severe fits—said to be epileptic—for forty-eight hours consecutively.

The mother thinks that the child could see before he had the fits, and the opacities in the pupils were not noticed till after their occurrence.

*Present State.*—Child is well grown but has no teeth. Rolls his eyes about and probably has no more than perception of light. The irides are brown, structure normal, pupils react to light and dilate evenly with atropine to about 7 mm.

The lenses, if uniformly opaque, are not of full size, as the iris throws a shadow. The right is probably smaller than left. The cataracts are not chalky and show some spermacetic lustre. No fundus reflex obtained.

Atropine improves the vision considerably.

Three months later I needled the left. The edge of the lens came into view in the pupil directly any pressure was put upon it, so it was evidently small. It was also very movable and elastic, the capsule being so tough that there was some difficulty in penetrating it, and when the needle was withdrawn the lens resumed its shape as if nothing had been done.

Two days after needling, the lens was found to be in the pupil gripped loosely by the iris; it had nearly come into the anterior chamber several times during the needling, but was in place when the eye was bandaged. As atropine failed to dilate the pupil, and there was obvious iritis as the result of the position of the lens, I made an incision and tried to get the lens away whole. This I failed to do, for it had softened too much, and after doing an iridectomy I abandoned the attempt. The lens subsequently shrivelled and as it contracted drew the iris (which was still adherent) up with it towards the corneal incision till the pupil practically disappeared.

I started my operative treatment of the right eye by doing an iridectomy.

My description of the lens as seen through the coloboma is: "The lens is shrunken, roughly circular, but outline and surfaces irregular. The whole of it lies within the

pupil. The anterior surface shows small tufts and excrescences lying at different levels and of different opaqueness."

Later I passed two needles well into the small lens and separated them till I got a clear opening. There was some evidence of swollen lens matter after this and the whole opacity flattened down leaving the central opening clear.

This child was defective mentally. He was very passionate, intolerant of any interference, and had a curious bleating explosive cry. Atropine improved his sight, iridectomy did so further, and the needling, while it resulted in the loss of one eye, gave him good vision in the other.

*Congenital Cataracts, probably Shrunken Lenses.*—Edith R., 7 weeks, sent on from Dr. Penrose's out-patients. The family history as to cataracts is negative. Is the youngest of eleven; born at full time. The others are all alive and healthy, and have good sight.

*Present State.*—Skin is somewhat earthy and mottled; forehead is prominent and face concave; Fontanelles widely open, as also lambdoid and metopic sutures. Neck is limp. Notices a light. Iris is of good colour. There are central cataracts which appear to be remains of shrunken lenses; the right is the larger, and has a fairly defined edge. The left is starred and granular.

I asked Dr. Penrose for an opinion as to the general condition, but have no note of his reply; but have a note of (?) syphilis which is probably copied from his out-patient letter.

I marked the case "for operation later," but on writing to the parents two years later, was told that the child died when 18 months old.

*Hereditary Syphilis. Congenital Cataracts, probably Full-sized Lenses.*—David J., aged 3 months. Mother married four years; four pregnancies, the first three resulting in the births of dead children, the fourth my patient. Probably full-time child, was well developed when born, but has wasted rapidly. Not suckled, but fed carefully and correctly. Has had snuffles and rash on buttocks.

My note at first visit was :—" Very yellow and emaciated. irides brown; A. C. normal. Pupils probably do not react to light but dilate about half to atropine. Major part of each lens is opaque, the opacity being patchy like soapsuds. Child is probably moribund." Under Dr. Garrod's care, however, the child improved rapidly, and eighteen months later I noted :—

" In fairly good condition now. Certainly has perception of light, but atropine does not improve vision. Speaking broadly, the whole lens is opaque, but as the anterior surface of the opacity is flocculent and irregular, the cortex is possibly clear. I think he sees too well for a full-sized wholly opaque lens. No fundus reflex obtained. Is lively, and very sensitive to variations in light."

I did an iridectomy on the right eye and subsequently opened the lens with two needles. I have no note that any difference in the lens was observed when seen through the coloboma. A sphenoidal mass of opaque lens matter came forward into the anterior chamber, probably the nucleus, and when last seen my note was: " Sight evidently much improved; grins broadly when a light is thrown on eye."

*Shrunken Lenses. Family Cataracts.*— Maud B., age not stated, but about 2 years.

*Family History.*—Paternal grandmother had cataracts when 18. Father was the third of seven children. He and the three males (out of the four born after him) all had cataracts. He was operated upon at Moorfields when 16. The others were also probably taken to Moorfields.

Patient is the second of three living children. One miscarriage. The eldest is a girl who has a "cast," but sight is good; the baby, a boy. I examined both these children and their lenses were clear.

Patient was a "full-time" child, hand reared, always delicate chest, never any fits.

*Present State.*—Fair-haired pink-skinned child. There is some lateral nystagmus and eyes roll about aimlessly. Pupils are circular and active, within each is a small central opacity apparently subpolar in position.

In the right it consists of a grey, gauzy, circular patch 4 mm. in diameter. In front of this is a central denser spot (not chalky) about 2 mm. across, and having a crenate margin. The larger part looks to me like an empty capsule.

The left opacity is much like the right, consisting of a circular grey patch behind, with a smaller projecting nodule at its centre. This is more chalky looking than in the right, and consists of a group of white spherules, "like a tiny pile of whitewashed cannon-balls."

I did an iridectomy in the right, which improved the sight very much, and later I needled this eye, using two needles to break up the central spot. As a result of this there was a slight projection of woolly swollen lens substance at the opacity, but no change beyond this. She can now see to run about the house and play with her toys. Her temper has improved even more than her sight, the former change being the one by which the mother is most impressed and for which she is most thankful.

In the notes of the cases which I have described there is little touching upon the presence of rickets in the patients; the omission is not due to my having failed to keep a lookout for this disease so much as to the difficulty of assigning to slight manifestations of it in London children their true importance. But speaking broadly I may say that, except in one case, the children were not markedly rickety.

The occurrence of fits of a severe kind in several of the cases is of more importance, but this brings me on to ground that is by no means unexplored, and opens up a possible controversy on parallel lines to the vexed question of why the lenses and the teeth show a time scar in cases of lamellar cataract, as well as the relation of these to the occurrence of fits. Assuming for the moment the congenital nature of lamellar cataracts, and the evidence I suppose, with the exception of Hutchinson's observations, is in favour of this, we cannot avoid, at any rate, a comparison of them with

other forms of congenital cataract. That the connection of lamellar cataract with rickets cannot be said to be very firmly established is, I think, shown by the discussion raised by Mr. Treacher Collins' paper on the subject at the Ophthalmological Society.

As regards the frequency of lamellar in comparison to other congenital forms of cataract, I may perhaps, without attaching undue weight to it, mention my own experience. During the years I have worked at the Great Ormond Street Children's Hospital I have seen several cases of cataract in addition to those here mentioned, but with the exception of one case which I have marked as of doubtful form in my notes, I have never seen a lamellar opacity.

I have been unable to note the state of the teeth in these patients, for the obvious reason that most of them had none.

I may just mention for what it is worth the fact that in two of these children the sight was supposed to be good till after the fits, and that the opacities were not observed till after the occurrence of these. One patient, with the exception of a "screaming attack" at one month old, did not have fits till she was three years old, though they were then very severe. The patients who were probably defective mentally were, with the exception of one exception, those in whom fits occurred.

Children born blind are perhaps likely to be suspicious and intolerant of any interference, especially if they are spoiled, but some, without being stupid, are certainly good-tempered enough ; in three of my cases the mothers owned that the children were unsound or unusual mentally ; this fact, I think, deserves consideration, for it bears upon the possibility of structural defect of the brain being a frequent association of a structural defect of the eyes. The combination of fits with low intelligence points to this, unless we are to allow the former to be the cause of the latter.

EDMUND JENSEN (Copenhagen). Bullous Keratitis. *Arch. d'Ophtal., April*, 1898.

Even the best and most copious works on ophthalmology have little to say regarding the theory of bullous keratitis; they usually record the rarity of the malady, its purely secondary character, either when it attacks an eye affected by glaucoma or an eye in a more or less profound state of malnutrition. These statements are correct enough so far as they go, but they make no reference to a different and very important cause of the disease. In 1872 and 1884 Hansen Grut described recurrent bullous keratitis of traumatic origin forming a typical clinical picture, but the type has not been universally recognised; Jensen therefore seeks to bring the subject before the profession once more.

He divides the cases of bullous keratitis into two classes—those in which the eye was previously healthy, and those in which it has undergone pathological changes; in the first group the cause is external, in the second internal.

Primary bullous keratitis arises thus. Some variable time after an abrasion of the cornea by the finger-nail, a twig or such object, there occurs an attack of severe pain in the eye, which always sets in in the morning when the patient wakes up. This pain is generally very severe, because the original lesion has made the nerve terminations hyperæsthetic, and at the same time the regeneration of epithelium is probably imperfect. It usually lasts a few minutes, ceasing with the occurrence of an abundant flow of tears. These attacks recur with varying frequency, sometimes almost daily, and the tendency to them may persist for years. The pain does not always cease on the occurrence of lacrymation; on the contrary, it may become more severe, resembling that due to the presence of a foreign body. There is photophobia, hyperæmia, œdema of the lid, &c. If one examines the eye at this stage he will discover a large bulla of the

cornea, which is frequently only half filled with clear fluid and can be displaced on movement of the lower eyelid; a small spot of cornea is seen to be dull, and the bleb or its remains can be picked off with forceps, leaving a large denuded surface with uneven margins extending to one-fifth or even to as much as one-half of the area of the cornea. After three days or a little more the denuded surface is again covered, but may break down soon thereafter, and the same process be repeated many times. In the majority of cases the patient is a woman, probably because the most likely accident to produce this lesion, viz., the scratch of a child's nail, is more apt to occur to a woman. It will be manifest from the above descriptions that there is no relation between this disease and herpes corneæ. The only requisites in order that a lesion may produce this sequela appear to be that the abrasion must be superficial and fairly extensive; the ordinary "foreign body" does not do it, but a scratch with the nail, with a piece of paper, splinter of wood, needle of ice, &c., will suffice. There is usually several months' delay from the time of the original accident until the development of the bulla, but it may arise after the lapse of two months, or even one, very rarely much sooner, and if once the bulla forms recurrence is very probable. The bleb, which is usually to be found in the lower half of the cornea, has been seen in certain cases to become infected, and iritis, septic ulcer of the cornea, and hypopyon to arise in consequence.

Diagnosis is quite simple, especially when examination is made by focal illumination while the bulla is present, but may be a little difficult in cases not seen till after the epithelium has been partially or wholly shed and the bleb destroyed, and where the cornea is much infiltrated in the neighbourhood. From herpes it is distinguished by the fact that the bleb is single, as well as by the different history. One might expect that an eye which had repeated attacks of loss of epithelium ran a great risk of becoming septically infected, but apparently there is no serious danger of a complication so dangerous. In regard

to the exact mode of origin of this lesion, the fact that an abrasion is a *sine quâ non* suggests at once some particular infection, but this is practically negatived by the long periods during which the eye is perfectly well; while the attacks themselves are not truly inflammatory but of the nature of "neuralgias." Hansen Grut has pointed out that a mechanical cause is much more probable; his theory is, that the original lesion lacerates the numerous nerve fibrils which ramify immediately under the epithelium, at the same time laying open many lymph cavities, especially those surrounding these nerve fibrils. Since this laceration is of considerable dimensions, it is natural enough to suppose that the process of regeneration is not quite easy, for on the one hand the nerve fibrils must be in a state of hyperæsthesia, and on the other the lymph thrown out remains as a layer of coagulated albuminous substance between the new epithelium and the adjacent tissue. Thus the epithelium is less firmly united to the substance proper than it ought to be, and one can readily imagine that a very slight irritation might provoke such a painful attack as has been described, the lymph then being poured out and raising up the bleb of epithelium. It is quite possible, too, that in certain persons there is a predisposition to this type of affection. It is a very singular fact that there have been observed cases in which a patient having received a "suitable" injury in one eye, has been attacked by bullous keratitis in the other! The great point in treatment is prevention; when an eye has been injured by such an accident as a nail scratch it should be carefully bandaged until healing is complete. When once the bleb has formed, the author advises that the shed epithelium should be picked away, atropine instilled and a bandage applied. For his own part the reviewer has never been able to perceive any advantage from picking away the epithelium, and considers that one is thereby more apt to denude more cornea of its covering and do harm instead of good. He is at one however with the author in condemning cocaine in such cases, believing that it diminishes the vitality of the epithelium

and delays its regenerative processes; the only advantage gained by its use is the temporary ease which it gives, which enables the patient to endure the discomfort more peaceably. Jensen disapproves of corrosive sublimate lotions also in such cases, and of the use of the cautery or any severe measures even when recurrence is frequent.

Secondary bullous keratitis, which occurs chiefly in glaucomatous eyes, is also dealt with in Jensen's article, but it is not necessary to discuss this lesion at present.

W. G. S.

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**Julius Wolff (New York). On Paralysis of the Associated Lateral Movements of the Eyes, with Preservation of the Power of Convergence.** *Archives of Ophthalmology, xxvii.*, 2.

Only a very small number of cases of this kind have been recorded, and the present one is an interesting addition to the list. The mechanism of the combination of paralysis of the external rectus of one side with that of the internal rectus of the other side in unilateral lesions of the sixth nucleus is still, says the author, an open one, although there have been many papers written on the subject; and its solution is difficult, because cases of paralyses of this kind are seldom observed uncomplicated by other symptoms, and even more seldom are examined *post mortem* in their uncomplicated condition. This is his reason for describing at length the following case, which he observed while working at the Cologne Eye Clinic.

C. K., a man, aged 71, was seen at the hospital for the first time in January, 1897. His medical history is shortly as follows. He says he never had a severe disease. Towards the close of the forties he suffered from attacks of vertigo, especially after any violent exertion, but since then these attacks have been rare. Denies syphilis, and there are no signs of his having had it. Always been a temperate man. For the last two winters he has coughed a good deal, but without expectoration or spitting of

blood. Examination of lungs reveals marked emphysema, but no tubercle. Over the ninth rib is a fistula leading to bone, and there is another at the upper end of the right tibia. No tubercle bacilli were found in the pus expressed from the fistulæ. Senses of smell and taste normal, and no affection of the facial nerves. Knee-jerks absent, but so also is Romberg's symptom. The patient is a little unsteady in walking, and keeps his feet rather far apart, but Wolff ascribes this slight degree of ataxia to his advanced age and to the diplopia referred to below. Urine contains 1·6 per cent. of sugar. No albumen. Till five weeks ago his eyes had not troubled him; then he noticed that things seemed double, and that the double images were much more distinct when he turned his eyes to right or left than when he looked straight in front of him. He thinks that since then his sight has been less acute than it was before. Pupils small; act well to light and with convergence. V. (right and left) $= \frac{6}{30}$, *c.* + 2·25 D. sph. $= \frac{6}{10}$. Reads J. 1 with + 5 D. at 30 cm.

When he looks straight before him the left eye deviates a little inwards (2·5 mm.). Movements of lids, and of the eyes *up and down* are normal, both when the eyes are examined singly and together. The left eye when examined alone shows complete absence of outward and nearly complete absence of inward movement. The right is affected in the same way but to a less degree; thus the power of outward movement is only slightly diminished—the external margin of the cornea can be abducted to within 2 mm. of the outer commissure, while adduction stops at a point 4 mm. inwards from the middle line. When the lateral movements of the eyes are tested with both eyes at the same time the result is as follows:—Movement of the left outwards absent as in the single test, movement of the left inwards raised to 3 mm. as against 2 mm. when tested alone. Movement of the right outwards as before, movement of the right inwards almost completely disappeared (this last shows a marked difference from the result with the single test). In other words, "the power of both eyes when uncovered to follow the finger

towards the left is entirely lost, while rotation to the right is only diminished, but more markedly on the part of the left internal rectus than of the right external rectus."

The power of convergence is normal in both eyes, the rotation reaching to a point 10 mm. from the bridge of the nose.

The results of testing for double images agreed with those of the objective examination of the eye movements. In the primary position there was homonymous diplopia corresponding to the convergence; as the light was moved towards the right the images came nearer to each other and then crossed, in accordance with the slighter paresis of the right external, as compared with that of the left internal rectus. On the left side the distance between the homonymous images increased, in spite of the complete paralysis of the associated movements towards this side. The author gives an explanation of this point, to which we shall refer at a later stage of his paper.

The diagnosis was hæmorrhage or embolism in the floor of the fourth ventricle, in the neighbourhood of the left sixth nucleus, with involvement of (or pressure upon) the region of the right sixth nucleus.

The patient was kept steadily under observation for some months. During this time the paralysis had at first got worse, the power of rotating the eyes to the right becoming weaker, and then again improved until on June 2, the date of the last examination, the note says "Paralysis of eye muscles is practically healed. The nystagmic movements of the right external rectus have almost disappeared, while the muscles which turn the eyes to the left merely show a slight tendency to become tired. The power of convergence has steadily remained perfect."

The patient was strongly urged to report himself at regular intervals, but nothing more was heard of him until early in August, when it was found that he had been taken to a hospital in a comatose condition two weeks before, and had died there on the following day.

The autopsy was made without any knowledge of his previous eye malady, and although the medulla and pons were divided by several transverse sections, the region of the

nerve nuclei was not examined as carefully as would otherwise have been the case; but as it was no localised lesions in the brain were discovered. There was œdema and emphysema of the lungs, much parenchymatous degeneration of kidneys, slight arterio-sclerosis, &c., but nothing that could be definitely set down as the direct cause of death. The urine had persistently contained sugar, and the writer therefore thinks there can be little doubt that the patient died in diabetic coma.

The case stands as a remarkably good example of bilateral paralysis of the associated lateral movements of the eyes, in which the power of convergence remained unaffected throughout, and in which also there were no complications caused by other paralytic manifestations, either motor or sensory. Wolff has been able to find records of only four similar cases, all of which he briefly summarises; he also refers very shortly to a few others, in which, however, there were complicating factors. As regards the seat of the lesion there are, he says, only two possibilities between which a differential diagnosis must be made, viz., a nuclear and a cortico-fibrillar (Dufour) seat, the latter being at that point where the tracts for the voluntary conjugate lateral movements of the eyes connecting the cortex with the nuclei of the opposite side cross each other. Assuming that the lesion is a nuclear one it would follow that each sixth nucleus governs the action of the internal rectus of the opposite side during conjugate lateral movement, and must therefore send nerve filaments to its respective oculo-motorius, a theory which is now pretty generally accepted, although it is doubtful whether the connection is a direct or an indirect one through the nucleus of the rectus internus. Against the assumption of a cortico-fibrillar seat is the fact emphasised by Wolff, that the two muscles which physiologically act together in lateral movements were not paralysed in an equal degree, either in his own case or in a case recently recorded in this journal by Mr. A. H. Thompson.[1] We quote Wolff's own words on this point;

[1] OPHTH. REV., April, 1897, p. 102.

he says: "Each of the tracts under discussion carries the impulses for lateral rotation of the eyes sent from the cortex to the sixth nucleus, and if this conduction is interfered with to a greater or less degree, a correspondingly great deficiency in this function must ensue. This deficiency must be the same on the part of the rectus externus and its associated rectus internus. For if the normal impulse is distributed equally over the two muscles, the partial or complete loss of this impulse must also be distributed equally.

"On the other hand, it is very easy to explain an unequal degree of paralysis in the two associated muscles, if the lesion is localised in the sixth nucleus. It is merely necessary to assume that those ganglionic cells of the sixth nucleus, which send nerve fibres to the opposite rectus internus, are grouped together, and either abut against the rest of the sixth nucleus or are separated from it by a slight intervening space, as has already been found to be the case with the various portions of the third nucleus. It would then merely be necessary that the one portion of the sixth nucleus were more seriously affected than the other, and a difference in the action of the associated muscles would result."

There is a good deal of testimony in support of such an arrangement of the sixth nucleus, but it is beyond the limits of this notice to discuss the evidence. Based upon the consideration of it, however, the author lays down the following dictum: "If two muscles concerned in the associated lateral movements of the eyes to one side are paralysed in an equal degree, the lesion may be situated either in or centrally from the sixth nucleus. But if during any stage of the disease these muscles are affected in an unequal degree, the lesion can be only in the region of the sixth nucleus."

Finally, as regards the difference in the power of movement when the eyes were tested singly and together, the most likely explanation, Wolff thinks, is the one advanced by Mœbius, who holds that the inward movement—apart from obvious convergence—which in a case published by

him could be effected only when the eye was tested singly, was really then also an act of convergence. This indeed was proved by the fact that the covered eye also assumed a convergent position when the uncovered eye moved inwards. In Wolff's case this point was unfortunately overlooked, but there is indirect evidence of its having held good here also, judged from the manner in which the distance between the double images increased when a light was moved to the left. Thus when the disease was at its worst, no response of the left external, and almost no response of the right internal rectus followed the greatest effort on the part of the patient to look to the left. One would have expected therefore that there would have been very little increase in the distance between the double images as the light was moved to the left. But, in point of fact, the distance did increase greatly, from 15 to 60 cm. when the candle was moved to the left with a radius of two metres, and the author explains it by an act of convergence which was probably effected in the interest of distinct vision by at least one, viz., the right eye. N. M. ML.

## HIRSCHBERG (Berlin). Glass-blower's Cataract.

*Centralbl. f. Augenh., April*, 1898.

At a recent meeting of the Berlin Medical Association, Hirschberg showed several patients, all glass-blowers living near Berlin, who presented a peculiar colouration of the face suggesting a residence in hot climates. They were all about 40 years of age, and had been some twenty-five or more years employed at the same trade. The alteration in the skin of the face, whereby it was reddened and hardened, was due to the exposure to strong heat, and was worse on the side most exposed to the glow of the furnace; the lesion of the eye for which they had consulted him was also present first on this side of the head. It seems that out of thirty glass-blowers employed by one firm five are aged more than 40 years, and all these five have

cataract, ripe in two instances, partially ripe in the others; all five men are strong and healthy. The other twenty-five employés are younger men and have not complained of any eye lesion as yet. The author gives a survey of previous literature of the subject, from which it appears that in 1886 Meyhöfer found more or less cataract in 59 glass workers out of 506 whom he examined, and of these 59, 42 were not yet 40 years of age. The same writer refers also to the skin lesion, remarking that it is present on the left side of the face, that being the side usually directed to the blaze of the furnace; and noted also that the left eye is that first affected. He had, moreover, examined the temperature to which such patients are exposed and found the thermometer to register 65° C. (149° F.) at the distance from the fire of the patient's usual station. With this temperature there must be a great outpouring of perspiration, which perhaps, in addition to the heat itself, has an influence on the development of cataract. Hirschberg notices the fact which impressed itself upon him in his Eastern travels, that the inhabitant of Calcutta or Bombay is operated on for cataract at a much lower average age than the inhabitant of Germany. It is a patient of 40 or little more who has cataract requiring extraction, not of 60, as at home. Under the intense sun of India, cataract comes on, then, twenty years earlier than in a less torrid land. And, similarly, he believes it to be true that among his own patients those from the country are distinctly younger than the urban inhabitants. He is driven, then, to the conclusion that long-continued exposure of the lens to heat rays of much intensity produces in time opacity of the lens. In this connection the question, Why is it impossible to see the ultra-red rays? is of interest. Certain observers, Helmholtz among the number, believe these rays to be absorbed before reaching the retina; others, including Tyndall, consider that the retina is itself incapable of appreciating them. The presence of the cornea and aqueous humour afford for a long time protection to the lens, but by and by the crystalline does suffer; the reason

why the cornea escapes damage is the much greater ease with which its nutritive and regenerative processes are carried on, as compared with the lens. The period of time required for the development of cataract by heat exposure is so prolonged that the subject does not lend itself to investigation and experiment upon animals. It appears that in the glass-blower the posterior portion of the lens is that which first begins to become opaque, and in the earlier stages progress is very slow; months or even years may pass by before the dimness, once begun, advances sufficiently far to necessitate advice, but during the later stages, after vision has become reduced to about $\frac{1}{10}$, the ripening is rapid. Recovery after operation is usually quite as satisfactory as in persons of similar age who are not glass-blowers. In regard to prevention, it may be said briefly that work people can rarely be induced to wear any protection such as might be provided to shield the face and eye from the glare during working hours. Hirschberg insisted in the case of one patient, with the result that the condition of the cheek considerably improved, but all apparatus of that sort is apt to be regarded by the patient as unnecessary and troublesome, more especially as the danger is so remote. A man of 25 will not constantly wear an ugly and inconvenient mask lest at the age of 40 (which he is apt to regard as a very distant prospect) he may perhaps acquire cataract; the risk is too vague and distant to inspire fear.

W. G. S.

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OTTO SCHWARZ (Leipzig). **The Significance of Ocular Symptoms in the Diagnosis of Diseases of the Brain and Spinal Cord.** *Berlin: S. Karger*, 1898.

In this book of 100 pages the author has put together in compact form a large amount of information, which he designs chiefly for the assistance of neurologists and ophthalmologists. It goes almost without saying that the

volume is largely, if not wholly, a compilation; but as it seems carefully done, a large saving of time may be expected by those desirous of looking up the subject of ocular symptoms in disease of the brain and spinal cord. The plan adopted by the writer is to give under the heading of each disease the ocular symptoms and signs commonly or rarely associated with it, and to point out the value, if any, of such symptoms in differential diagnosis. He includes all the common and many of the uncommon forms of disease of the brain and cord. One of the last subjects in the book is "Hysteria," and under this heading the author gives a fairly detailed and useful account of the various ocular manifestations of this nerve disorder. He recognises the importance of distinguishing between mere functional disturbance and organic disease, and the diagnostic value of ocular symptoms to this end.

The book will, we think, be a handy and valuable addition to the literature of the subject, both from the neurological and ophthalmological standpoint.

## OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Mr. H. R. Swanzy, President, in the Chair.

Thursday, May 5, 1898 (Clinical Evening).

*Chip of Steel in the Eye, with Skiagraph.*—Mr. Ernest Clarke and Dr. Mackenzie Davidson showed a case of chip of steel in the eye with skiagraph. The patient was struck by a chip of steel in the right eye in November, 1897. A scar could be seen in the cornea and in the anterior and posterior portions of the lens capsule. The opacity in the lens had somewhat increased since, and vision was reduced from $\frac{6}{12}$, when first seen, to $\frac{6}{24}$. A skiagraph taken by Dr. Mackenzie Davidson showed that the piece of metal was lodged in the ciliary region at the lower part. On ophthalmoscopic examination a mass of exudation could be seen at this point.

The exposure necessary had now been reduced to ninety seconds, and in the case of a child to one minute.

*Ophthalmoplegia Externa with Impairment of the Orbicularis Palpebrarum.*—Dr. James Taylor showed a case of ophthalmoplegia externa with impairment of the orbicularis palpebrarum. Hughlings Jackson had first drawn attention to a case exhibiting weakness of the orbicularis in paralysis of the third nerve exemplifying Mendel's hypothesis that the ultimate nerve supply of the orbicularis was the third nerve. Mention was made of the similar association between paralysis of the orbicularis oris and the hypoglossal nerve.

Dr. Beevor said that he had shown a case at this society a few years ago in which there was double ptosis and weakness of the orbicularis; it was probable that in most of the cases where the nucleus of the third nerve was involved the orbicularis was affected. Dr. Taylor's case was important, as other muscles which had a nerve supply originating in the bulb—those of the palate—were affected; he believed this to be rare.

Mr. Flemming said that anatomists were now agreed on anatomical evidence that the orbicularis was supplied from the third nerve nucleus.

*Rudimentary Development of the Iris.*—Mr. John Griffith showed two cases of rudimentary development of the iris. The patients were brother and sister, in whom the iris was present only as a rudimentary band, which was absent in the lower outer part entirely; the choroid and ciliary body were normal. In one of the cases there were anterior polar cataracts without sign of previous perforation of the cornea, and the lenses were slightly displaced upwards. In both patients there was defect of the enamel of the teeth and there was a history of fits.

Mr. Sydney Stephenson had shown at the Society two brothers with aniridia in whom there was deficiency of the enamel of the teeth known to dentists as hypoplasia.

*Conical Cornea treated by the Galvano-Cautery.*—Mr. G. A. Critchett showed a case of conical cornea treated by the

galvano-cautery. The improvement in vision had been in the right eye from $\frac{6}{60}$ to $\frac{6}{9}$, and in the left from $\frac{6}{60}$ to $\frac{6}{24}$. In the last series of cases, about 15 in number, he had tried not to perforate the cornea; he used the cautery wire at the lowest possible red-heat, so that not much more than the epithelium was affected; the whole area intended to be affected was burnt with this, then at a slightly greater heat he burnt a smaller disc within this area; then at a higher temperature still he burnt the centre at a point only. During the first burning the aqueous disappeared and the iris came into contact with the cornea. He used a flat, medium-sized point except for the central and last burning, when he used a small one.

Mr. Hartridge asked the reason for using the different degrees of heat; he was in the habit of using one temperature only and had never seen the aqueous disappear.

Mr. Critchett said he thought a better cicatrix was obtained by this method.

Remarks were made by Mr. Doyne, Dr. Collins, Dr. Taylor, Mr. Griffith, and Mr. Gunn, in reply to which Mr. Critchett said that although the iris in these cases was in contact with the cornea, the aqueous did not completely disappear in the centre of the pupil, and mentioned one case in which perforation during the application of the cautery was followed by escape of aqueous. Tension was diminished. The cautery was applied outside and below the centre of the pupil, so as not to interfere with the visual portion, the apex of the cone being also below.

*Case of Retinitis Circinata.*—Dr. Fischer showed a case of retinitis circinata. The patient was a woman, aged 66, unconscious of anything the matter with her left eye. She was healthy and had no ascertainable kidney disease. The right eye was normal; in the left there was well-marked retinitis circinata completely surrounding the yellow spot, which was degenerated.

Mr. Lawford thought this case was not typical inasmuch as there was little or no change at the yellow spot, and the band of exudation was distinctly raised. The other eye also was quite free from retinal disease.

Mr. Gunn thought this one of the manifestations of old-standing œdema of the retina, and that it was similar in nature to the asterisk seen in renal retinitis. There were arterial changes in this case.

Mr. Doyne thought that the exudation was decolourised blood. The greater functional activity in the macular region explained the earlier absorption there.

Mr. Hartridge had shown a case at the Society some years ago; the exudation had since entirely disappeared, leaving only pigmentation.

*Peculiar Condition of the Lens.*—Mr. Marcus Gunn showed a peculiar condition of the lens in a child who had a cataract in the right eye which had been diagnosed in early life, but nothing had been done for it. The right iris was much lighter in colour than the left; there was punctate deposit on the back of the cornea; the centre of the pupil was like an ordinary opaque membrane, with holes in it through which the optic disc could be seen with + 10 D. The peripheral part of the lens appeared like a brown grey granular exudation raised above the level of the central capsule. He thought this might be possibly a uniocular cataract which had undergone spontaneous shrinking, leaving organised lymph on the suspensory ligament.

*Card Specimens*:—The following were shown:—

Mr. Rockliffe: (1) Two specimens of cystic retina; some of the cysts were between the inner and outer nuclear layers, and the others were difficult to locate owing to degeneration of the retina; and (2) specimens of pseudo-glioma.

Surgeon-Captain Herbert: Specimens of epithelial xerosis of the conjunctiva.

Mr. Devereux Marshall and Mr. Ridley: Specimens of persistent hyaloid artery with atypical development of the vitreous.

Dr. G. H. Hogg: A case of polyceria.

# ON THE ÆTIOLOGY AND EDUCATIVE TREATMENT OF CONVERGENT STRABISMUS.

*Being the Bowman Lecture of the Ophthalmological Society, Delivered on Friday, June 10th, 1898.*

By PRIESTLEY SMITH.

PROFESSOR OF OPHTHALMOLOGY MASON UNIVERSITY COLLEGE, AND OPHTHALMIC SURGEON, QUEEN'S HOSPITAL, BIRMINGHAM.

MR. PRESIDENT AND GENTLEMEN,—We are met to do honour to the memory of William Bowman. To me, and probably to others here present, it seems but a very little while since Sir William Bowman was amongst us as the President of this Society; interesting himself in its success, giving to it, from the beginning, something of his own dignity and high position; guiding its discussions with that combined authority and simplicity which those who knew him are not likely to forget. Some of us, looking back a little further, recall him as he used to be at Moorfields,—the quiet keen observer, the thoughtful teacher, the perfect operator; a leader among those, all well remembered, who were the leaders of those days.

But the greater part of Bowman's career belongs already to the region of history. He came to London and to King's College in the first year of the Queen's reign. Within the next few years he published those researches in physiology which brought him early fame and a Fellowship and medal of the Royal Society. He became surgeon to the Moorfields Hospital in the very year which saw the birth of the ophthalmoscope, and in the same year formed that close friendship with von Graefe and with Donders which it is so interesting to recall. The most inspiring pages in the history of ophthalmology, I think, are those in which Donders tells the achievements of Graefe and of



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Helmholtz, and those others, within a few years later, in which Bowman does honour to the memory of Donders.

Going still further back, I may claim for my own city of Birmingham a close connection with Bowman's early life. He received most of his schooling at the old Haslewood School; a model of the school-house made by his clever hands stands to this day in the library of a fellow scholar, now one of our oldest citizens. He chose his profession there, and entered it by apprenticeship to a Birmingham surgeon. He began his work with the microscope, and his fruitful study of pathology at the Birmingham General Hospital. In after life he recalled these old associations in a very generous manner.

To be appointed Bowman Lecturer to this Society is a great honour, and always will be; to me, remembering Sir William Bowman as I do, it is this and a great deal more, and I am deeply grateful to the Council for giving me the privilege.

For the cure of strabismus measures of three kinds are employed at the present day—optical, operative, and orthoptic, or, as I should prefer to say, *educative;* the aim of this educative treatment being to lead the patient, not merely to *direct* his eyes, but to *use* them in the normal way; to teach him the forgotten art of binocular vision. We combine these several lines of treatment variously according to the nature of the case before us, and our own individual estimate of their value.

The importance of optical treatment in a large majority of cases is admitted by all. Thanks to Donders we know that the common forms of strabismus are very frequently dependent, to a certain extent, on errors of refraction, and that a continuous use of correcting glasses will usually diminish the squint, and sometimes banish it completely. Atropine and the shadow test enable us to prescribe glasses correctly even for young children, and the difficulty of getting them worn is less than it was a few years ago. The average parent now knows that the child who squints is probably in need of glasses, and often expects even more benefit from them than they are capable of giving.

Again, the value of *operative treatment* in a large proportion of cases is beyond question. It is true that the original operation introduced by Dieffenbach nearly sixty years ago, and very widely practised by him and others for some years, gave many bad results and fell into disrepute. That was inevitable; for not only was the operation faulty in method, but it was employed as the sole treatment, without knowledge of the underlying optical conditions. But all that is changed. Operation is now usually a supplement of other treatment, and the *technique* is greatly improved. We still differ, no doubt, on points of detail, but the differences are not fundamental, and the results now commonly obtained by operation are excellent as far as they go.

The *educative treatment* of strabismus, that is, the systematic use of the monocular shade, the reading bar, the stereoscope, and so forth, stands on a different footing. Javal,[1] the chief exponent of this system, who has used it for many years and elaborated it with infinite ingenuity, declares that it is not only an important auxiliary before and after operation, but is capable by itself of curing certain cases. Other well-known authors, among them our President in his admirable handbook, advise exercises in certain cases; some members of this Society have employed them, I believe, for years past. We most of us possess a stereoscope; but, unless I am mistaken, there is at present no general agreement as to the value of this line of treatment, and no very general employment of it; indeed, one well-known writer goes so far as to doubt whether the cases which have been cured by it would not have got well without it, and whether those which are incurable without it are ever curable with it.

*What is the value of the educative treatment of strabismus?* That is the main question which I desire to raise. Until about two years ago I had myself attempted little in this direction. Since that time I have studied it so far as time and opportunity would permit, and in so doing have received help from Dr. Javal, which I desire here

[1] "Manuel du Strabisme." Paris: G. Masson, 1896.

gratefully to acknowledge, especially his kindness in showing me his methods and many of his cases during a short visit to Paris in the early part of last year. The experience gained even in this short time is certainly of value to myself, and may, perhaps, be of some use to others.

There are, of course, cases of squint in which binocular vision is recovered without special exercises of any kind, and others in which it is irrecoverable by any means whatever. The debatable ground lies between these extremes. The object I had in view was not merely to try certain methods in a few selected cases, but to obtain, if possible, some classification of cases according to causes, age, course, and other characters which should be a guide to the use of these methods. It was easy to find ample material for investigation, not easy to deal with it adequately; for the points in which cases differ from each other, and the pitfalls which beset the unwary observer, are very numerous. Since January 1, 1897, all cases of concomitant convergent strabismus coming under my care, including a few the treatment of which had begun earlier, were examined by myself and noted on special printed forms.

Permit me briefly to review the methods of examination. At the first visit the following points were noted: the age; the age when the squint began, if ascertainable; the circumstances of the onset, if any, were clearly stated. Then the nature of the squint, whether periodic or continuous; if continuous, whether alternating or monolateral. Thirdly, the fixation power of the squinting eye as tested by the ophthalmoscope and corneal reflex. If the patient, with his good eye well covered, could fix the mirror correctly with his squinting eye, "*true* fixation" was noted; if not, "*false* fixation." Lastly, the angle of the squint was measured by the tape.[1] The measurement occupies only a few seconds, and presents little difficulty even in young children. The tape I now use measures

[1] OPHTHALMIC REVIEW, vol. vii., p. 349, 1888.

60 cm. in length instead of 1 m. as formerly. (The tape method assumes concomitancy; where this is not complete it involves an error, but not to an extent which affects the present question. The measurements obtained with the tape are not exactly comparable with those obtained when the eye fixes a distant object. Maxwell found the angle of the squint to be on the average 2 degrees greater in fixing a point at ·25 m. than in fixing a point at 6 m.[1]) This done, atropine was ordered.

At the second visit, the eyes being under atropine, the refraction of each was determined by means of the shadow test, supplemented, when possible, by use of the test types. Then, with corrected refraction, the acuteness of vision was ascertained when possible. In presence of important ametropia, spectacles, to be worn constantly, were ordered. Those for whom glasses were ordered were examined thereafter, whether as to acuteness of vision, angle of deviation, or what not, always in their glasses, unless otherwise noted.

While the eyes were under atropine any obvious faults in the media were noted. I had intended to note the condition of the fundus also, but soon abandoned the attempt on account of the great additional labour it entailed. So far as it went the routine examination of the fundus gave almost entirely negative results. Heredity was not investigated, but it was observed in many cases.

Up to this point the observations related chiefly to the origin of the squint and to the conditions present when treatment was begun. Re-examination from time to time showed the progress and the effects of treatment. Beyond this there were certain tests, employed chiefly in the later stages, which I must describe more fully. They were concerned mainly with the presence or absence of the faculty of fusion.

First as to *fusion-sense*, *i.e.*, the potential faculty, as distinguished from the actual habit, of fusion. The squinter, looking at an object such as a lighted candle,

[1] *British Medical Journal*, Sept., 1896, p. 818.

sees it single rather than double, because he has learned to take no notice of the image in the squinting eye. Will he be able to perceive both images simultaneously and to fuse them if we succeed in putting his eyes approximately straight? The only way in which we can test the point beforehand is by taking two similar objects and placing them so that while the straight eye fixes the one, the squinting eye fixes the other, and so that each eye can only see its own object, as in the stereoscope. This small instrument (fig. 1), which for convenience I will call the "fusion-tubes," is esssntially a miniature stereoscope,

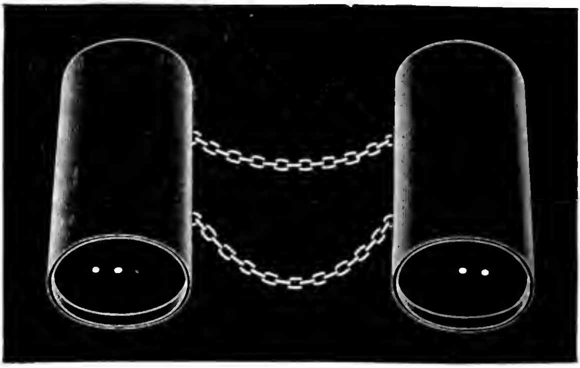

FIG. 1.—Fusion-Tubes.

admitting of free adjustment for abnormal positions of the eyes. Two short tubes are held together by chains which permit movement in any direction. At one end of each is a biconvex lens; at the other a shutter provided with a small round hole at the centre, covered by a piece of ground glass. The distance between lens and shutter equals the focal length of the lens, so that the emmetropic eye looking through the lens sees the hole with relaxed accommodation, as though it were a distant object. Holding the tubes in a divergent position before my own eyes I see the two holes at some distance apart, and now, making them parallel, I see only one, for the two images

are fused. Some persons who habitually squint can fuse these images, either at once or after a little practice, by bringing the tubes into a convergent position. Others cannot do so. But it will strike you that, in using such an instrument, the squinter who declares that he sees the two holes as one may be using only one eye. For the avoidance of that fallacy each shutter is provided with a second hole a little to the outer side of the central one, and this second hole is coloured by a film of gelatine, red in the one tube, green in the other. Now the squinter who, at first view, sees four holes—two white, one red, and one green—and then by converging the tubes joins the two whites into one while he continues to see the red and the green, has, we may assume, a potential faculty of fusion, although, under ordinary circumstances, he is unable to exercise it and cannot even be made to perceive the two images of one object.

Now as to the *limits of this fusion power*. The patient, we find, is able to fuse the two images when the tubes stand at a certain angle of convergence. Can he vary that angle and still fuse them? Can he voluntarily abduct or adduct his eyes in the interest of binocular vision, and if so, within what limits? The fusion-tubes can only give rough indications on this point. For the purpose of accurate measurement I have placed them in a frame (fig. 2) which supplies fixed points of rotation, with a scale showing their angular movement. Moreover, the central hole in each shutter is replaced by a narrow vertical slit, so that in cases where the deviation is not strictly horizontal, fusion may still be attained by a vertical overlapping of the slits. Having placed the tubes in a position which enables the patient to fuse the white lines, we very slowly move one or other, first outwards, then inwards, and note the point in each direction at which he is unable to maintain the fusion of the lines, and sees them double. In this form, therefore, the instrument can test, not only the presence of fusion power, but its angular limits.

In certain cases, especially those which appear to be nearly or completely cured, another question suggests

itself. What position do the eyes assume when the stimulus of fusion is withdrawn? What is their *angle of equilibrium?* In other words, is there any important heterophoria or latent squint remaining? To test the point by means of the same instrument we cut off, by means of a movable shutter, the upper part of the one slit and the lower part of the other, so that the two images cannot be fused, and tell the patient to place the tubes so that the one white line stands exactly over the other. This is not a perfect test for heterophoria, for the patient may relax

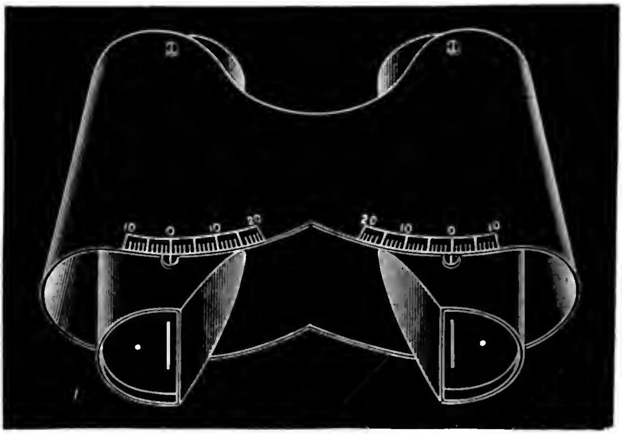

FIG. 2.—Heteroscope.

his convergence less completely than when tested with a distant object; still it is practically useful and easily applied. The instrument in this form, being distinct from the fusion tubes, must, I suppose, have a distinguishing name. For want of a better I have called it a *heteroscope*, an instrument with which a deviating eye sees.[1]

The remaining tests were for the purpose of ascertaining whether actual fusion, that is binocular vision in looking

[1] The fusion tubes and heteroscope were made by R. Bailey, Bennett's Hill, Birmingham.

at a single object, had been re-established. A completely satisfactory test of this point is difficult to find, and the more so because binocular vision is a faculty which presents various degrees of perfection.[1]

I decided to adopt as the initial test for actual fusion, the principle of Snellen's coloured glasses and coloured letters. Spectacles carrying red and blue glasses in a reversible frame, so that either colour may be placed before either eye, are placed on the patient's face in front of his own glasses. He is then shown, at reading distance, a card with three discs on a black ground, a white one in the middle, a red above it, a blue below. He is asked how many rounds he can see. If he can see all three at once and in a line, he is probably using both eyes, and fusing the two images of the white disc. Covering each eye in turn, we put the question again. If with each eye alone he sees two, but with both eyes three, we have a fairly conclusive proof. Still it is possible that he has learned by experience what answers will please the examiner and save himself further trouble, and that he frames his replies accordingly. On each disc, therefore, is a black letter, and these, if he knows his letters and has sufficient vision in the eye which formerly

[1] The induction of diplopia by means of a prism is no proof of binocular vision, for there are many persons who do not fuse, and who do not see double under ordinary conditions, who yet perceive the second image the moment it is displaced to an unaccustomed part of the retina by means of a prism. The induction of compensatory movement to correct diplopia, by a prism held before either eye in turn, is good evidence of binocular vision; but it is difficult, in children especially, to make sure whether such movement does or does not occur. Again, the ability to read with a pencil or other object placed midway between the eyes and book cannot be tested in the case of young children and slow-minded persons, and is, moreover, no proof of fusion, for some patients with slight alternating squint can readily accomplish this "bar-reading," as we may call it, although they are entirely unable to fuse. Hering's drop test, and, still more, Berry's stereoscopic movement test, are too exacting for the patient who is only beginning to use his eyes in concert, for the faculty of seeing in perspective, of appreciating solidity, comes of long practice in forming visual judgments, and cannot be expected in those whose education in this art is only just beginning.

squinted, he must read. By using several cards bearing different letters, we can exclude this source of error. If we find, however, that he can see all the three discs with one eye only, we know that the colours do not neutralise each other, and this will sometimes happen if the card be viewed in too strong a light, especially if the pupils be large. On the other hand, on foggy days and in artificial light, the blue disc may be hidden even by the blue glass from a normal eye: the examiner must not expect the patient to see what he cannot see himself. Having proved the presence or absence of fusion at reading distance, we repeat the test at three or four metres, using larger discs. One other source of possible

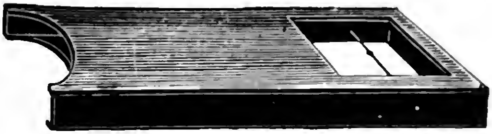

FIG. 3.—Box for drop test.

fallacy must be mentioned; the patient who appears to be using his two eyes simultaneously, may possibly be using them alternately; with good vision in both eyes and a facility for suppressing it in either, he may have a rapidly alternating squint, and no real fusion. In such cases the patient will confess that, though he can see the three discs, he cannot see them all at once or in a straight line. He should be tested with the discs in a horizontal line as well as in a vertical. This test for binocular vision of an elementary kind seems to me to be a good one for practical purposes; it occupies not more than a minute or two, and is applicable to young children. A child too young to read, but able and willing to count one's fingers, one, two, or three, can by its means be tested for fusion with considerable certainty.

For the sense of perspective—the higher development of binocular vision which is learned by the continued

practice of fusion—I used Hering's drop test.[1] This box is the instrument actually employed (fig. 3).

These were the tests. Let us now turn to the results, and first to those which relate to *the causes and natural course of the disorder.* Remembering how carefully of late the etiology of strabismus has been studied by Hansen Grut in his Bowman Lecture,[2] by Lang and Barrett,[3] Berry,[4] Adams Frost,[5] Maxwell,[6] Holthouse,[7] and others in this country, to say nothing of what has been done abroad, one might well shrink from broaching the subject here; seeing, however, that our knowledge of it is still in parts uncertain, I make no apology for attacking it again.

TABLE I.—*Onset Age in general, and in relation to True and False Fixation* (261 *cases of Convergent Strabismus*).

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 and over | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| All cases ... | 16 | 31 | 38 | 63 | 35 | 36 | 9 | 11 | 8 | 6 | 2 | 1 | 5 | 261 |
| True fixation | 13 | 17 | 26 | 50 | 27 | 31 | 8 | 11 | 8 | 6 | 2 | 1 | 5 | 205 |
| False fixation | 3 | 14 | 12 | 13 | 8 | 5 | 1 | ... | ... | ... | ... | ... | ... | 56 |

The most conspicuous point in the etiology of convergent strabismus is *the early age* at which it usually begins (Table I.). Donders saw its onset mostly about the fifth year, and warns us against accepting reports of its appearance in very early infancy; but later observations, my own included, show that more cases begin in the fourth year than in the fifth, many in the third and second, and some even in the first. In my own cases the onset age

[1] See *Brit. Med. Journ.*, June 20, 1896.
[2] *Trans. Ophthal. Soc.*, 1890.
[3] *Roy. Lond. Ophthal. Hosp. Reports*, vol. xii., pp. 7 and 133, 1888.
[4] *Edin. Med. Journ.*, Jan.—March, 1897.
[5] *Brit. Med. Journ.*, 1887, vol. ii., p. 663.
[6] *Ibid.*, 1896, vol. ii., p. 818.
[7] "Convergent Strabismus." London: Churchill, 1897.

was registered only when it could be fixed with some degree of precision, and in many instances I myself saw a squint already established in the first year or two of life. I do not attach a precise value to the figures in this table, but I would lay stress on the fact that *the disorder commonly begins at a time of life when the visual apparatus has hardly reached completion either in structure or function.* This is important in relation to our present inquiry. Let us look for a moment at the process by which normal vision is acquired in early life.

The much debated question whether the co-ordination of eye movements represents innate structure or acquired habit cannot be dogmatically answered. It is one of degree. Co-ordination is both innate and acquired, and variously so for different organs and different animals. The chick picks up grains of food within a few hours of leaving the egg, and after a few false shots strikes them with precision. Here the co-ordinating mechanism is complete or nearly so before it is used. The human infant is far behind the chick in this respect. His faculties, destined ultimately to be of higher order, come to perfection more slowly. His first eye movements, though already co-ordinated automatically for bilateral action, are purposeless, like the first movements of the limbs.[1] They have no relation to external objects. They represent activity in the lower levels or centres of the brain, uncontrolled by perception in the higher.[2] The higher levels are still undeveloped. His vision at birth is a mere perception of light. Soon he begins to notice conspicuous objects, then to recognise and follow them, and by the end of twelve months he watches all that goes on in his neighbourhood. We cannot test his vision at this age, but it is certainly not yet acute. He will pay no heed to minute objects. Even when he is old enough to learn his letters these must at first be large, and unless

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[1] W. Preyer, *Die Seele des Kindes*, Leipzig, Grieben, 1884.

[2] See "Automatism and Control," in Lloyd Morgan's "Comparative Psychology." London: Walter Scott, 1894.

I am mistaken, even when he is able to name them all, he will still for a time be found unable to recognise Snellen's No. 6 at six metres. During these early years, too, his refraction alters. Beginning with a considerable hypermetropia, like a lower animal he gradually approaches emmetropia, but at six years of age has usually some hypermetropia still.[1] The visual apparatus with which the infant comes into the world is rudimentary; it is elaborated by use; the fine adjustments are made by practice and observation. The onset of strabismus in a young child involves an interruption and even a reversal of this process. What are the conditions which induce it?

The best known cause of strabismus is *hypermetropia.* By explaining the nature of this defect and its relation to accommodation and convergence, Donders founded almost a new branch of science, and conferred immense benefit on the legions of hypermetropes who are always with us; but in this question of strabismus his teaching has, I think, by reason of its importance, dominated some of us too exclusively—at least that has been my case. When a squinting child has been found to have no hypermetropia, or worse, to persist in squinting when his hypermetropia is corrected, one has felt surprised, if not annoyed, that he should thus violate a great scientific principle. It would have been wiser to revise the limitations of the principle.

*How far does convergent strabismus depend on abnormal accommodative effort?* This question, raised many times since Donders wrote, is partly one of statistics, and must therefore be approached with special caution. A leading American authority declared only last year, on the strength of statistics, that strabismus depends "almost entirely on hypermetropia, with an exception that does not reach 1 per cent." I have tabulated 310 cases (Table II.), placing them in five groups according to the refraction in the fixing eye. It is the fixing eye that determines the

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[1] B. A. Randall, "A Study of Refraction in School Children," *American Journ. of Med. Sciences*, July, 1885 (p. 25 in reprint).

amount of accommodative effort. Astigmatic eyes, of which there were many, were classed with others according to their mean refraction; for, as Carl Hess has shown,[1] the astigmat does not, as was formerly supposed, adjust his accommodation intermittently for one or other of the chief meridians, but persistently for the mean of these, because in that way he obtains a better picture on his retina than in any other. Thus an eye with H.2 in one meridian and H.4 in the other habitually accommodates as though it had H.3 all round, and may for our present purpose be classed with hypermetropia of that amount. The influence of astigmatism on the acuteness of vision is of course a separate matter.

TABLE II.—310 *Cases of Convergent Strabismus. Refraction under Atropine.*

| | No. of Cases. | Per Cent. | |
|---|---|---|---|
| M. | 3 | 1 | |
| E. to H. 1·5 D. | 34 | 11 | |
| H. 2·0 to 3·5 D. | 106 | 34 | 88 |
| H. 4·0 to 5·5 D. | 122 | 39 | |
| H. 6·0 and over | 45 | 15 | |
| | 310 | 100 | |

But such figures give no sufficient answer to our question. They show certainly that a very large majority of squinting children examined under atropine are hypermetropic, but this is true, as we have seen, of the large majority of non-squinting children also. We want to know not what percentage of squinters are hypermetropic, but what percentage are abnormally so. Where shall we draw the line? If we reject, from my own cases, all those of less than 2 D., we have 88 per cent. remaining. If we reject a somewhat higher grade we shall have a lower percentage, but still a large one. The figure has no definite value. This, however, we can safely say: that grades of hypermetropia which are exceptional among people in general, even in early life, are prevalent among

[1] *von Graefe's Archiv*, vol. xlii., pt. ii., p. 80, 1896. See OPHTHALMIC REVIEW, Feb., 1897, p. 48.

those who squint. Clearly they predispose to the occurrence of squint, or actually induce it in certain cases. But we have to remember, on the other hand, that a considerable contingent of squinters have little or no hypermetropia, and that the vast majority of hypermetropes have no squint.

Before speaking of other causes I will ask your attention to a point which has perhaps received less consideration than it deserves—*the relation between the amount of the hypermetropia and the angle of the squint.*

Under normal conditions a given amount of accommodation is associated with a corresponding amount of convergence. The two efforts being habitually made together are to some extent inseparable, but not entirely so. The link is elastic. We can all of us dissociate the two acts to some extent. The ordinary hypermetrope learns to regulate this association so as to meet the special requirements of his eyes; he acquires the habit of converging normally while he accommodates abnormally, and does so as a rule without much difficulty, for, as George Berry[1] has shown, the latent tendency to abnormal convergence in the hypermetrope is usually slight as compared with the amount of the hypermetropia. We might therefore expect that the exceptional hypermetrope, who, as Hansen Grut put it, is a *duffer* in this respect, who fails to acquire this necessary habit and squints instead, would present a deviation either proportionate to the amount of his hypermetropia, or falling somewhat short of it. But this is not so. The angle of the squint greatly exceeds that which the hypermetropia would seem to require.

This diagram (fig. 4) exhibits the fact as observed in 239 cases. It shows, firstly, the normal direction of the two eyes when fixing a point 60 cm. distant, that being the distance employed in my measurements. Secondly, it shows the positions which the one eye, on renouncing binocular vision, should theoretically assume while the

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[1] *Loc. cit.* (p. 8 in reprint).

other eye still fixes the same point with an excess of accommodative effort equal to 1, 3, 5, and 7 D. respectively. Thirdly, it shows the actual degrees of deviation found in my four groups of cases.[1] You will see that

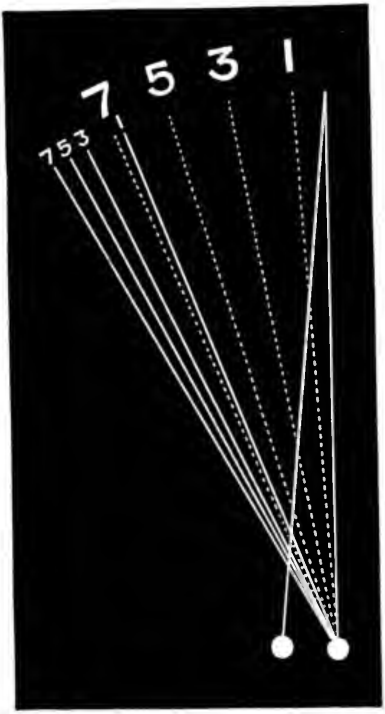


FIG. 4.—1 3 5 7. Angles corresponding to the hypermetropia.
1 3 5 7. Angles actually present.

although the actual deviation increases with the hypermetropia, it is not in proportion to it, low grades of hypermetropia being associated on the average with a deviation of as much as 22 degrees, while high grades

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[1] The figures 1, 3, 5, and 7 are slightly higher than the mean refraction in my groups, but this only renders the discrepancy more striking.

increase it by only 8 degrees. The same discrepancy may be seen in the figures given by Holthouse. Maxwell specially refers to it.

What is the explanation ? Why does the hypermetrope when he squints at all, squint so much more than would seem to be necessary ? Please observe that he does so not only when the squint is of long standing and may have led to secondary changes in the muscles and connective tissue of the orbit, but while it is still recent. Certainly the deviation increases with time up to a certain limit, but it is excessive very soon after it begins. Is it a voluntary and purposive act for the more complete avoidance of diplopia ? This view has, I think, been commonly held, but it is not altogether satisfactory, for if the extra deviation were maintained by an effort of the will for the purpose suggested, it would surely be abandoned to some extent when the squinting eye was covered, and would hardly occur at all when the squinting eye is comparatively useless; whereas it is sometimes these useless eyes that squint the most. Is it not rather the overaction of a motor centre which has escaped from conscious control ? The maintenance of fusion depends, as we have seen, on brain action of a complex nature; on lower centres which act when uncontrolled, without regard to purpose, and higher centres which control them. There are many conditions in which failure of the higher centres leads to overaction in the lower. Writer's cramp is a familiar example. In this disorder, as the control of the finer movements fails, the coarser actions of the hand and arm become exaggerated, until a violent overaction sets in which is not merely useless but prohibits use. In strabismus we have probably exhaustion of the controlling centres, and we have something more. Whereas the palsied writer continues to perceive most painfully his inability to control his hand, the squinter quickly loses the perception which should guide his eye. The sense of fusion falls into abeyance not by the mere withdrawal of one image, as when the eye is covered by the hand, but by a purposive inhibition or suppression of

it. This suppression confirms the loss of control, and degrades the act of convergence to a purely automatic level.

*Inequality of vision in the two eyes* is an important factor in the causation of squint. When considerable it lessens the value of binocular vision and increases the difficulty of maintaining it. It is due sometimes to disease or injury of the eye, but such cases are exceptional. The opacities of the cornea or other media on which most authors lay stress were found in less than 5 per cent. of all my cases. We have chiefly to distinguish between that inequality of vision which depends simply on unequal refraction in the two eyes, disappearing when this is corrected, and that which persists in spite of such correction.

As regards refraction, the squinting eye is frequently inferior to its fellow, having a higher degree of H., of As., or of both. Holthouse found equal refraction in only one seventh of all his cases; I, to my surprise, found it in nearly one half. Probably I overlooked differences of 0·5 D. or more in many cases, especially among the younger children, but I feel safe in saying that anisometropia sufficient in itself to seriously depreciate the value of binocular vision is not a very prevalent condition. On the other hand, an inequality of vision not removable by correction of the refraction is very common. Among cases in which vision could be tested it was present in 78 per cent., slight in some, but considerable in a large number; in 23 per cent. of all my cases the squinting eye had no power of true fixation.

*What is the nature of the amblyopia of the squinting eye?* Is it a cause or a consequence of the squint? Donders attributed it to progressive loss of vision through habitual suppression. Javal still adheres to this view. Schweigger,[1] and, following him, many others, regard it as a congenital defect which precedes and in large measure causes the squint. There is little evidence to show that an eye which has once acquired good vision can lose it through

[1] "Das Schielen." Berlin: Hirschwald, 1881.

squinting. Were this the case we should expect to find the faculty recoverable by use; whereas, though some improvement is often obtainable in this way, the amblyopia is usually to a large extent incurable. But whether an eye which begins to squint long before the development of vision is completed may not lose something is another question. We cannot test the point, but, remembering how transient are the impressions received at one, two, and even three years of age—how a familiar face not seen again is absolutely forgotten—a language partly learned but not used later, entirely lost—we may suspect the occurrence of such loss. The loss of fixation power by an eye which has previously possessed it is almost a proof of loss of visual power.

For the other view there is more to be said. Many of these squinting children are more or less amblyopic in both eyes, and it is clear that the defect in the fixing eye cannot have been caused by the squint. It is, at most, only the *excess* of amblyopia in the squinting eye that can be explained in this way, and even of this there is no proof. Seeing that in many cases both eyes fail, through faulty development, to reach the normal standard of vision, it is reasonable to suppose that in some the failure is unequal in the two eyes, or even confined to one, and therefore that the amblyopia precedes the squint and plays an important part in causing it: indeed, no other view is possible in those cases where we find great inferiority in the squinting eye shortly after the onset of the squint.

But we may look at the question from still another point of view. To speak of the amblyopia of squint simply as a congenital defect is misleading. All eyes are amblyopic at birth—highly amblyopic. Those which later reach the standard of normal vision do so by a process which occupies probably several years. If strabismus be established before this process is complete, the further visual progress of the squinting eye is likely to be hindered if not arrested.[1] This view of the matter finds

[1] See also Barratt and Lang, *loc. cit.*

support in the fact that the cases which present the greatest amblyopia seem on the whole to be those of unusually early onset. Among cases beginning during the first three years of life a much larger proportion had false fixation than amongst those beginning later (see Table I.). That some beginning even in the first year had true fixation may have been owing to the squint being alternate, or remaining periodic till a later age. Moreover, the results of disuse would vary not only with the actual age of onset, but with the state of development at that age. Many squinting and amblyopic children are distinctly backward; they walk late, talk late, are dull and unmanageable, and are behind others of their age at school. Of course it may be that these highly amblyopic eyes squint earlier than others just because they are amblyopic, but I think we ought not to leave out of consideration the possibility that the early onset of squint may arrest the visual development of the eye. The question is important in relation to educative treatment.

*The onset of strabismus* is often attributed to a fit, a fright, a fall, or other such occurrence, and still more often to an illness, such as whooping-cough or measles. Making allowance for the frequency of such events among children, and for a certain disregard of time and sequence in their elders, it seems to me highly probable that these supposed causes are very often real causes. Some such explanation of the onset was given, with show of reason, in more than two-fifths of my cases, and the proportion would no doubt have been higher had not many of the patients been brought by persons who knew nothing of their antecedents. In many cases the history was definite and not to be upset by cross-examination. For example, a child who had never been seen to squint before, came from school squinting badly, having that morning been put into the corner with a cloth over her head; another did the same immediately after having his head pushed into a bucket of water by his brother; another after sitting in scalding water; another after being terrified by a monkey which jumped on to her shoulder. No less clear in many cases was the

history of onset during measles, whooping-cough, or other constitutional disorder. All these are conditions which may gravely disturb the nervous system. Shock, anger, or apprehension impair the control of muscular action; they cause the knees to shake, the voice to tremble, and even the hand of the ophthalmic surgeon to become unsteady. Febrile disorders cause delirium, convulsions, and sometimes transient strabismus, and leave the nervous system exhausted. Is it not highly probable that such disorders occurring in young children may interrupt the action of those higher centres which control the movements of the eyes, and this not only where control is already difficult by reason of amblyopia or error of refraction, but even in children whose visual apparatus is normal for their time of life, but not yet fully developed?

Given a cause of onset, *the progress of the disorder* is easy to understand. At first the squint is usually periodic, coming and going with accommodative effort; but each lapse tends to facilitate recurrence, and in time, as the suppression of the deviating image becomes confirmed, the squint becomes continuous. We see this change occur in individual cases, and we can infer its general occurrence from the fact that the cases which we see soon after the onset are very frequently periodic, while those of long duration are very rarely so. In 52 cases of periodic squint the average duration before treatment began was two years; in 100 cases of continuous squint it was five and a half years. It is unfortunate that so few of these children come under treatment in the periodic stage—16 per cent. in my experience—for it is then as a rule that the squint is cured most easily. In some cases, however, a squint appears to be continuous from the very onset, and in some it certainly remains periodic for many years, though on that point an error of observation is easily made; some cases which appear to be periodic are really continuous, but variable in degree; the corneal reflex shows a small deviation during the periods of supposed intermission, and binocular vision is, of course, continuously absent.

Both in the periodic and in the continuous stage the

large majority of squints are monolateral ; in a total of 318 cases I found 259, *i.e.*, 81 per cent., to be so. The alternating squints, constituting 19 per cent., were characterised with few exceptions by nearly equal refraction and nearly equal vision in the two eyes. But the two groups are not absolutely separable ; a squint which is usually monolateral is not necessarily so at all times ; the behaviour of the eyes will vary according to the precise method of testing them.

In the continuous stage, whether the squint be alternating or monolateral, the suppression of the deviating image becomes more and more complete, and the act of convergence becomes more and more dissociated from visual perception. The heteroscope shows this clearly. The great majority of squinters old enough to be tested with this instrument or with the fusion-tubes, can see with the two eyes simultaneously ; they see the four holes, two white, a red, and a blue. Some of them with a little trouble can fuse the two white holes when the tubes stand in a particular position, their sense of fusion is not entirely lost ; but they cannot maintain the fusion when the tubes are abducted or adducted from this position by a single degree. They have entirely lost the notion of making a voluntary effort for the avoidance of diplopia.

Some have no sense of fusion, or fuse in spurious fashion, placing the tubes so as to blend a macular picture in the one eye with an excentric picture in the other, according to ingrained habit. This we might expect where the squinting eye has lost fixation-power, but it is surprising when met with in a patient who has normal vision in both eyes, as in some cases of alternate squint. The alternate squinter is an expert in the arts of suppression and so-called false projection. He fixes his object with either eye at will. In the other eye, at the same moment, he suppresses the macular picture which he does not want, and develops to some extent the misplaced image of the object looked at, projecting it not falsely but truly in spite of the false position of the eye.

These secondary perversions of the visual function are

at once consequences of the squint and causes of its perpetuation.

The foregoing may be summarised as follows :—

(1) Convergent strabismus is a disorder of innervation in which the visual centres fail to control the act of convergence. This act is thereby degraded. It becomes purely automatic and purposeless. It is excited by the associated act of accommodation. It is excessive because it is uncontrolled.

(2) The failure of control depends largely on faulty development of the visual apparatus. The fault, whether it be in the eye or in the central organs, is frequently hereditary. In many cases the power of control is lost through shock or illness during infancy.

(3) Hypermetropia, when of considerable degree, predisposes to strabismus, and sometimes causes it, by demanding an abnormal effort of control. Hypermetropia of low degree does not account for strabismus in a child.

(4) The disorder is confirmed and perpetuated by suppression of the function of the squinting eye. In treating it we should aim at stopping this habit of suppression and establishing the habit of binocular control.

These conclusions tell *a priori* in favour of educative treatment. But treatment must be judged by its results. In this series of cases educative measures were employed to a considerable extent, but hardly ever alone—always, or almost always, as auxiliaries to operation and the use of glasses. Moreover, treatment was often incomplete, being abandoned or neglected by reason of time, trouble, or expense, so that the results in mass are no true measure of the curability of the disorder. Again, I have no standard of results obtained in other ways with which to compare the present. It is clear, therefore, that the question at issue cannot be answered by a mere appeal to figures. Still it may be useful to give some general statement before speaking of particular results.

I take for analysis 251 cases which came under treatment during the year 1897, those registered since the beginning of the present year being on the whole too

recent for this purpose. During the last few months I have endeavoured to re-examine the whole of this series; and though that proved impossible, I am able to say something as to the present state of just 200 of them. Of these 200 when last seen, 57 had binocular vision of a certain kind; they appeared, under the red, white, and blue test, to fuse both in near and in distant vision. Separating the periodic from the continuous squints, I find that 59 per cent. of the former and 18 per cent. of the latter had recovered in this way. Eleven others fused in near vision and were not tested for distant vision, the importance of this having for a time escaped my notice. Nine others almost certainly had binocular vision, but were too young for the actual test. Twenty-two more fused in near vision, but used one eye only in distant vision. In these latter cases it was most interesting to observe how the child when standing, say, at three feet from the card would see the three dots at once, and then, on taking one step backwards, being unable to diminish the angle of convergence sufficiently for that distance, would instantly suppress the use of one eye and see two dots only. In the remainder, *i.e.*, in just about one half the cases of known result, binocular vision was absent both in near and distant vision. This latter group included many patients who were cured as regarded appearance. It naturally included most of those who had false fixation at the outset, and many in which the treatment had been abandoned or interrupted.

These figures, please remember, relate to fusion merely, *i.e.*, binocular vision of an elementary kind, not to the fully-developed sense of perspective or solidity. This latter was recovered in sixteen cases, as proved by the drop test, and probably in others, for the test was not applied, as it should have been, to all who had recovered fusion. I have lately observed that those who fuse in near vision only may see in perspective at that distance, although suppression with one eye occurs in distant vision.

These results, no doubt, are not all final. Some of these patients have the faculty of fusion on uncertain

tenure and may lose it in the future, especially if they are careless as to using glasses. On the other hand, some who have it not will probably still acquire it, and those who retain it will certainly develop it more fully. Those, especially, who have it now in near but not in distant vision are likely to extend it to the latter also. I have seen this happen several times.

I pass, in conclusion, to the *specific results of educative treatment.* The means employed were of three kinds: occlusion of the eye by means of a shade or pad; bar-reading, and the use of the fusion tubes, these being intended as a simple substitute for the stereoscope.

*The shade* was used with more or less persistence in 118 of the 251 cases. Its purpose is not so much to give the squinting eye a greater acuteness of vision, as to compel it to use such vision as it has to promote fixation and to prevent or stop the habit of suppression. There is a period when the faculty of fixation can be saved—or lost. In January, 1897, I saw a child of eighteen months with periodic squint of short duration in the left eye. The eye fixed the mirror readily, as shown by the corneal reflex. Both eyes under atropine had H. 3 D. I ordered a shade for the good eye, and should probably have given glasses later, but the treatment was neglected. Fifteen months later I saw the child again, and found a continuous squint with false fixation. In contrast with this my records show seven cases which at first had false fixation, but recovered true fixation under treatment. In every instance the recovery was aided by the wearing of correcting glasses, but it would not have come about without occlusion of the fixing eye, for it was attained before the squint was got rid of, so that without compulsion the squinting eye would never have fixed at all. Binocular vision is now re-established in one of these cases, and appears to be so in two more, but the children are too young for the actual test. False fixation, then, though usually incurable by any reasonable amount of effort, is not always so, and in young children especially we ought, I think, to give the eye a chance.

In the more hopeful and larger class where the squinting eye has still the power of true fixation the shade is often of distinct advantage. Just where the advantage is probably the greatest, namely, in young children, we cannot measure it, but we can see it. At first the child rebels; endeavours to remove the shade or to look sideways from behind it; failing this, is awkward in guiding itself, is apt to fall, is unable to put its finger smartly on a given spot—in short has *false projection* through using its sight in an unwonted way. Soon, however, these difficulties begin to disappear; the shade is tolerated; the mother assures us that the child can use the eye much better, or, perhaps, complains that we have driven the squint into the other eye. The eye has become more useful through being used. In my series I find ten cases which, at first monolateral, showed a tendency to alternate after persistent occlusion of the fixing eye. Such advantage, no doubt, is transient if we stop the shade and proceed no further, but when we follow it up by operation it helps unquestionably in the recovery of fusion.

During treatment the vision of the squinting eye, as measured by Snellen's letters, rose a little in many of my cases, greatly in a few. Some of this improvement may have been due to the continued wearing of a proper glass, for eyes which have no squint frequently show a gradual betterment of vision during the few months following the correction of refractive errors. In one case, however, vision rose from $\frac{6}{60}$ to $\frac{6}{12}$, though the same glasses were worn throughout and had been worn for some years when the case came under treatment. In this case, together with the use of the shade, a large divergence due to operation eight years earlier was corrected.

For stopping the habit of suppression the shade is invaluable. When glasses, or glasses and operation, have brought the squinting eye into fairly good position, there often remains a trifling squint which the patient makes no effort to correct. He cannot, for he is not conscious of the displaced image. By covering the fixing eye for a time, we may arouse the dormant vision of the other,

and he may then be able to perceive the two images at once, and to unite them by adjusting the position of the eyes. To cure the habit of suppression, the shade must, for a time, be worn constantly on one eye or the other: on the good eye as much as possible, and at other times on the bad one, for the squinting eye had better be in darkness than continue to form images which the brain does not perceive. Occlusion of the good eye for a certain time each day may suffice to prevent a young child from losing the faculty of fixation, but it will not banish the habit of suppression.

I have usually attempted to occlude the eye by means of the ordinary celluloid shade with an elastic cord, placing the shade beneath the spectacles, but this is sometimes difficult to manage. A pad of cotton wool held in position by the spectacles often answers better.

*Bar-reading*—the *lecture contrôlée* of Javal—was used in thirty-one cases. A bar of some kind, such as a paper-knife, a ruler, or a strip of card, is held between the eyes and the book in such a way as to hide a part of each line from each eye respectively. The patient's own fore-finger will answer the purpose if held properly, and has the advantage of being always at hand. The most convenient implement, I think, after various trials, is a thin strip of metal (fig. 5) bent in two places at a right angle so that it can be held upon the book with a thumb or finger. It is steady in relation to the book, and can be moved easily up and down the page. The patient must be taught how to use it. When his fixing eye reaches that portion of the line which is hidden from it by the bar, he must use his other eye. There must be no guessing and no dodging movement of the head or book. At first the bar will block the line completely. To show him that the other eye can help him out if he will make it work, we cover the fixing eye for a moment with a screen. Next we teach him to occlude it for himself, at first perhaps with his hand, but as soon as possible by a momentary closure of the lids. He will learn this in a day or two, if not at once. Soon he will be able to travel

along the line with only a slight hitch where he closes the better eye, and at last he will read smoothly keeping both eyes open. No one who has seen a patient work his way through these several stages can doubt that bar-reading aids in the recovery of binocular vision. It is chiefly effective when practised in conjunction with the use of the shade. The following example was an early one in my experience, and strongly encouraged me to further trials. A young adult who had squinted from

FIG. 5.—Bar-reading.

early life was treated by glasses and operation. A slight deviation inwards and upwards remained. He had no diplopia and no spontaneous tendency to fuse. With the tubes he could fuse without much difficulty. He was advised to cover the fixing eye, to uncover it only for the purpose of bar-reading, and to practise this latter as much as possible. At first the reading was difficult, but he worked at it with a will, and in six weeks was found to have actual fusion. Bar-reading was continued for a while for fear of relapse. Re-examined ten months later he had fusion both in near and distant vision.

One other example. A girl, aged 17, had a large alternate squint of fourteen years' duration. She got glasses and a single tenotomy. Eight weeks after the operation she still had a squint of 5 degrees or 15 degrees according to which eye she used. She was then taught bar-reading and wore a shade over the right eye in the morning, the left in the afternoon (Javal). Two months later she fused in near vision, and a fortnight later in distant vision also. The drop test, to my surprise, now showed sense of perspective. Five weeks later the result was maintained.

The value of the method in certain cases is beyond question. Its weak side is that it is inapplicable in very early life. To older patients it affords an interesting occupation.

The *fusion-tubes* were used, together with other treatment, in twenty-one cases. The plan was to let the patient hold them in such a way as to blend the two white holes; then to separate and join these many times in succession so as to get the idea of fusing double images; then to overlap them partly and try to make them go together by looking at them. Lastly, to practise this at home. Seeing that this exercise grows easier with a little practice, I presume that it serves to stimulate the sense of fusion. It is irksome if long continued, but interesting for a while, and can sometimes be managed by children who are too young for the reading-bar

With the stereoscope proper I have done almost nothing; time failed for any sufficient trial.

The old idea that the squinting child needs a little skilful cutting and nothing more is dying out. Most people know that glasses are often necessary. But that the child may require *teaching*, at some trouble, to use the squinting eye, is a new idea to many. It is easily grasped, however, and *must* be grasped if our efforts are to be effective. I have used the word *educative* as a help in that direction. Of course there are parents and there are children on whom all time and trouble spent in this way are entirely thrown away, but on the whole I have been surprised at the care and patience with which directions have been carried out, even in homes where one might least expect it.

In this lecture I have stated only my own experience; it has been impossible to compare it with that of others. I have referred but little even to Javal; but those who know his work, especially his recent "Manuel du Strabisme," will know how much I am indebted to it. On some points of etiology his views are, I think, open to question, but as regards the education of the visual function which he has so ably advocated, I am convinced that the principle is true and the method practically useful. Used, rarely by itself, usually in conjunction with other treatment, it promotes real as distinguished from apparent cures of squint, and gives the maximum security against relapse.

## OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Mr. H. R. Swanzy, President, in the Chair.

Thursday, June 9, 1898.

*Retinitis Proliferans.*—Mr. Percy Flemming described a case of Retinitis Proliferans. The specimen was obtained from a man aged 22, who died from chronic renal disease. The following appearances were seen on section: the posterior part of the retina was much thickened, folded and detached; a thin membrane stretched across the vitreous cavity from the ora serrata to the posterior part of the retina; another membrane had a similar origin in part, but ended freely about the middle of the vitreous cavity; the space between these membranes and the retina was occupied by blood-clot; there were signs of cyclitis. The chief microscopic appearances were a thickening of the retina and disorganisation of its inner layer, a definite transformation of the clot (as seen in successive sections) into connective tissue membrane with lacunar spaces, and a pulled-out condition of the retina near the ora serrata, resulting in elongation and rupture of Müller's fibres. It was possible to trace a direct continuity between the membranes and the retinal tissue. A review of previously

recorded cases was given and the suggestion made that the essential factors of the disease were: (1) hæmorrhage, and (2) an inflammation of the sustentacular tissue of the retina allied to sclerosis of the central nervous system.

Mr. C. Wray referred to two cases, one of a man, aged 68, with glycosuria, who exhibited detachment of retina and retinitis proliferans in the right eye, and vitreous hæmorrhage and a vascular formation from the optic disc resembling the skeleton of a leaf in the left. There was no necropsy. The other, also a man, aged 35, with a similar condition of the vitreous, had also detachment of the retina; his vision had improved under continued large doses of potassium iodide from fingers at 3 metres to $\frac{6}{9}$ths, and he had been able to work during the last five years.

*Œdema of the Conjunctiva due to Obstruction of the Lymph Stream.*—Mr. Holmes Spicer described a case of Œdema of the Conjunctiva due to Obstruction of the Lymph Stream. He said these cases presented themselves in two groups, the acute and chronic. In the acute cases, owing to a poison received into the conjunctival sac, the pre-auricular and cervical lymphatic glands became inflamed, although the local signs of conjunctival irritation were not marked. The flow of lymph was hindered and a condition of extreme œdema of the conjunctiva was produced, in which the conjunctiva hung out from between the closed lids as a flaccid gelatinous bag. Two cases were narrated in which the glandular enlargement was increased by the simultaneous occurrence of follicular tonsillitis. In the second chronic group, owing to a post-suppurative inflammation of the lymphatic glands of one side of the face and neck, great cicatrisation had been produced, the lymph stream was hindered, the subconjunctival tissue spaces became filled with the solid constituents of the lymph, and a condition of solid œdema resembling elephantiasis in other parts remained, which was persistent in spite of treatment.

Dr. Rayner Batten cited two cases in females, aged respectively 12 and 13 years, in whom œdema affected the conjunctiva and lids, causing limitation of movement of

the globe. Incision into the orbit elicited nothing, though there was proptosis. No rheumatic history existed, but the condition subsided rapidly under salicylates.

Mr. Bass laid much stress on the coexistence of follicular tonsillitis in the cases reported, suggesting that the conjunctival sac was probably infected from the saliva in moistening the lids, which often adhered.

*The Pathogenesis of Anterior Polar Cataract*—Mr. Treacher Collins read a paper on the Pathogenesis of Anterior Polar Cataract. He first described a case in which a melanotic sarcoma of the anterior part of the ciliary body, coming in contact with the antero-lateral part of the lens, had produced an opacity of the lens in that position, which presented precisely similar microscopical appearances to those seen in anterior polar cataracts. This, he thought, strongly supported the view that these latter resulted from contact of lens and cornea arresting the osmosis of nutritional fluids in the lens. He next demonstrated the microscopical characters of a congenital cataract where there was a large anterior polar opacity, beneath which the lens fibres had undergone such extensive degeneration that the whole lens was much flattened from before backwards. He thought the changes could be accounted for by prolonged contact of the lens and cornea in fœtal life, after the anterior fibro-vascular sheath of the lens had disappeared. He then quoted several cases in which, besides an anterior polar opacity, there was a second opacity situated beneath it a little deeper in the lens. In all these the cataract had been formed in early life and several years had elapsed before the patient came under observation. He showed a drawing of the microscopical appearances of a lens presenting two such opacities. There was the usual laminated mass at the anterior pole, then some normal lens fibres, and then an area where the lens fibres had broken up into irregular amorphous granules and detritus. This area corresponded fairly accurately in shape to that of the mass at the anterior pole, and he thought there could be no doubt that they were at one time in contact, having become separated by the gradual growth of new lens fibres inwards between them.

*Splinters of Steel removed from the Eye with the Electro-Magnet.*—Mr. Simeon Snell related two cases in which Splinters of Steel were removed from the Eye with the Electro-magnet. (1) From the retina, with preservation of excellent sight. The chip was observed with the ophthalmoscope as fixed in the retina in the outer and lower quadrant; the fragment had passed through the cornea close to the sclero-corneal junction, and when the patient was first seen four days after the accident the glistening of the steel was distinct, but the foreign body was partially covered with exudation. The patient could count fingers. The electro-magnet was inserted eight days after the accident between the inferior and internal recti and the fragment was removed. Later the vision equalled $\frac{6}{24}$. (2) From the vitreous, the foreign body being localised by the X-Rays. The patient was not seen for several weeks after the accident. The foreign body was diagnosed as having entered the upper part of the cornea, passing through the lens into the vitreous. Dr. McKenzie Davidson used the X-Rays and localised the splinter in the upper part of the vitreous. A skiagram showed it to be needle-shaped, measuring 8 mm. in length, and placed obliquely. The electro-magnet (fifteen weeks after the accident) was introduced through a scleral incision between the inferior and internal recti and the splinter was at once removed. The patient could afterwards count fingers.

Dr. Tatham Thompson spoke of the difficulty sometimes experienced in withdrawing the foreign body from another direction so as to get it end on. He thought one of the chief advantages in using the X-Rays was the power of excluding foreign bodies in doubtful cases.

*Value of X-Ray Examination in Old Injury to the Eye.*—Mr. W. Lang described two cases illustrating the Value of the X-Ray Examination in instances of Old Injury to the Eye with Defect of Vision. The first patient consulted him for failure of vision going on to total amblyopia, in whom there was a small corneal scar with corresponding openings in the iris and lens. Though there was no history of injury a foreign body was suspected, and a skiagram by Dr.

McKenzie Davidson revealed one in the lowest part of the vitreous covered up by opaque tissue. The second had a recent wound of the cornea, iris, and vitreous, but no foreign body could be seen. This was subsequently located in the sclerotic at the fundus. There was a small hole in the choroid. No operation was attempted in either, as the eyes were quiet.

*Large Fibroma of the Upper Eyelid.*—Mr. Simeon Snell related a case of Large Fibroma of the Upper Eyelid. The patient, a man, aged 43, never remembered being without the tumour, and it had only increased in size very slowly. At the time of his being first seen it was pedunculated, of the size of a filbert, and by its weight and situation interfered with the movements of the eyelid and with vision. It was attached to the left upper eyelid just outside the punctum. It was dissected off. The tumour was white and glistening in section, and under the microscope was found to consist of fibrous tissue.

*Toxic Amblyopia.*—Mr. Anderson Critchett showed a case of toxic amblyopia which was attributed to poisoning by iodoform. An elderly woman suffering from an extensive cancerous ulceration of her breast had been in the habit of applying iodoform to the ulcer for a period of more than three years. She developed somewhat suddenly extreme amblyopia, lost the power to recognise any colour except blue, for which she had a large central scotoma, and was found to have slight pallor of the outer half of each optic disc and a small granular change to the inner side of each macula lutea. Since the iodoform had been stopped (ten weeks) the return of her colour vision had been very decided, she could recognise any colour by indirect vision, but still had a large central scotoma. Her visual acuity was still very bad, though it had shown some improvement.

*Card Specimens.*—Mr. Hartridge: Phagedæna of the eyelids.

Mr. Charles Wray: (1) Pemphigus of the conjunctiva; and (2) skiagram of a foreign body in an eye.

Dr. Tatham Thompson: Intra-ocular granuloma.

# A CASE OF ACUTE EXOPHTHALMIC GOITRE.[1]

By John Griffith, F.R.C.S.

Assistant Ophthalmic Surgeon and Pathologist to the Royal Westminster Ophthalmic Hospital.

Since Jessop[2] brought before the notice of the Ophthalmological Society cases of exophthalmic goitre with severe ocular lesions, a very serious example of the kind has come under my care. The symptoms developed suddenly and both eyes were destroyed with rapidity; for these reasons I have called it a case of *acute* exophthalmic goitre.

Cases of the kind are rare, and as this is the only one that has come under my notice I have no hesitation in making it the subject of a short communication with the idea of eliciting opinions as to their successful treatment; for not only in this instance but in those recorded by Jessop and others the treatment has not prevented loss of sight.

The patient was a servant girl of a nervous temperament, aged 21, single, and had only recently left her situation owing to the state of her health.

She came under my care at the Royal Westminster Ophthalmic Hospital towards the latter end of May of the present year. She told me that until the end of last March she had had nothing wrong with her eyes and her general health had been good. On March 29 she had a

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[1] Read at the meeting of the British Medical Association, Edinburgh, 1898.

[2] *Ophthal. Soc. Trans.*, vol. xvi., p. 187.



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severe pain in both eyes, preceded for a week by slight puffiness of the eyelids each morning. She was in service at the time, but as the pain was severe she was sent home, and was attended by Dr. Montgomery, of Maidenhead.

She attributed her illness to over-work, and, though I was unable to obtain any history of sudden fright, worry, or anxiety from her, I learnt from her mother that in spite of the fact that she had been three years in service she lived in constant dread of her mistress; whether this was a morbid fear without reason, or whether she was really ill-treated I could not discover, though I am inclined to believe the dread was unnatural and without a cause.

In reply to me, Dr. Montgomery kindly sent the following report of the case:—

"The girl was first seen by me in the beginning of April. She then had enlargement of the thyroid and other signs of Graves' disease. There was a tiny speck of ulceration of cornea and slight conjunctivitis, but there was no inability to close the lids till two or three weeks later, from which time the exophthalmos increased rapidly. The urgent condition did not arise until the beginning of May. The remedies I used were iodide of potassium, iron, and arsenic internally, and locally boric acid and cocaine. I also closed the eyelids by means of strips of plaster covered by a pad of lint and kept in position by a bandage and constantly moistened with iced water."

This description by Dr. Montgomery fills in the gap between the onset of the attack and the time she attended the hospital.

The course of her illness under my care was rapid and severe. Coming into the hospital on May 25, it was necessary in less than three weeks to excise both eyes. In other words, both eyes had to be removed in less than three months from the onset of the attack.

On her admission the condition of her eyes was as follows:—

*Right Eye.*—Vision was only perception of light. The whole cornea was cloudy, but the lower two-thirds

showed a surface irregular, dry, scaly, and yellowish-grey from inflammatory infiltration. It was also anæsthetic, though the eye was very painful. The ocular conjunctiva was intensely red and much chemosed, projecting two or three millimetres in front of the cornea. Like the cornea it was dry, lustreless, and anæsthetic. The eyelids could not be closed, and with the greatest effort she could only cover the upper fourth of the cornea. Any movement of the proptosed eye caused pain.

*Left Eye.*—Vision good; it was not taken accurately, but judging from the scarcely perceptible corneal haze I do not think it could have been less than $\frac{6}{12}$ Snellen. She said that this eye had been bad but had improved. There was no corneal ulceration, only a slight nebula just below its centre, no chemosis and scarcely any redness of the ocular conjunctiva. The eye was as prominent as the right, and though incapable of bringing the eyelids together, she was able to approximate them to within about four millimetres; upon relaxing the effort they sprang apart. The sensation of the cornea was dull though not lost. Involuntary nictitation was in abeyance. Owing to the pain upon moving the eyes it was difficult to elicit von Graefe's lid-sign, and, so far as I could discover, it was absent. Such was the condition of her eyes when I first saw her. She also had slight enlargement of her thyroid gland, which pulsated, there was visible throbbing of her carotids, and she had fine tremors. She was a pale, nervous, and delicate girl. Pulse 136 per minute. Cardiac sounds normal; no murmur heard anywhere over the chest. Urine normal.

The following is a summary of the events as they took place. I do not propose to enter into them in detail.

*May* 25.—Patient admitted to the hospital. An attempt was made to keep the eyelids closed with india-rubber plaster.

*May* 28.—Plaster was found in contact with both corneæ and the eyelids wide apart. Great pain in both eyes. The whole of the right cornea was dry and scaly, at its lower part it was yellow. The left cornea was dry, lustreless, and hazy. No chemosis.

In the right eye complete tarsorrhaphy was performed, in the left eye median tarsorrhaphy, with silk sutures.

*May* 29.—Eyelids quiet and in apposition. Left eye was painful, but the right felt comfortable.

*June* 1.—Eyelids were slightly apart, great tension on sutures, both eyes were visible, and the edges of the eyelids swollen and red. Stitches removed with immediate wide separation of the lids. Great pain in both eyes.

*June* 3.—The pain was agonising in the right eye. The cornea was dry, yellowish-brown in colour, and surrounded by a wall of solid red œdematous conjunctiva. Mr. Hartridge was consulted, who agreed that immediate excision should be performed. The eye was excised in the evening. Even after the eye was removed the œdematous conjunctiva protruded from between the gaping eyelids.

*June* 4.—The excision gave complete relief on that side, but her left eye was still painful. Goggles were used to protect it, and the eye was frequently bathed with normal saline solution.

*June* 8.—Left eye was very painful. Cornea very dry and scaly, and an opaque yellowish-brown colour. The ocular conjunctiva was chemosed, red, and dry. In fact the left eye now presented a similar appearance to that of the right at the time of its excision.

*June* 11.—Morphia had not given her any relief. She obtained no sleep, and her general health was in a precarious state from the intensity of the pain. Perception of light had gone from her remaining eye. She wished to part with it, and as all hope of saving it was lost, the eye was excised.

*June* 15.—The excision relieved her suffering. She slept well and took her food. The colour came back to her cheeks, and in every respect her general health rallied. Her pulse was still rapid and tremors were very marked indeed.

On June 22 she left the hospital to go home prior to going to a convalescent establishment.

During her stay in the hospital she did not have any

constitutional treatment beyond rest in bed till after the right eye was excised. She was then given tincture of strophanthus combined with iodide of potassium. This did not materially improve her condition. Her temperature was, with scarcely a day's exception, two degrees above normal. After her eyes were removed it came down to 99° F.

This completes the details of the case—one of the worst and saddest it has ever been my lot to witness, and one in which no treatment was of any service.

It is a matter of regret that the pathology of Graves' disease is still in obscurity. If we are to believe that the symptoms are an outcome of excessive secretion of the thyroid gland, *i.e.*, the result of an auto-intoxication, excision of that organ, wholly or in part, ought to be attended with success. Is that the case? Arthur Maude[1] says: "I collected in 1893 twenty cases of operation on the thyroid for Graves' disease. In eleven the whole gland was extirpated, with great improvement in all, and absolute recovery in several. Half the gland was removed in two instances with great improvement." The other cases were not those of thyroidectomy. His evidence is certainly in favour of the operation. Others speak less favourably; moreover, a death has occurred during the operation.

According to Abadie,[2] the surgical treatment of exophthalmic goitre ought to be a division of the cervical sympathetic cord above the middle cervical ganglion, or even extirpation of this ganglion. He bases his views on the theory that the complaint is the outcome of a disturbance of the vaso-dilator fibres of the sympathetic. He brings to light the opinion of Trousseau, that the manifestations of the disease are limited to the area governed by the cervical sympa-

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[1] *Med. Soc. Trans.*, vol. xvii., p. 12.
[2] *Archives d'Ophtalmologie*, 1896.

thetic. He believes that the thyroid is only secondarily involved. For this reason he is averse to the operation of thyroidectomy.

Total bilateral extirpation of the cervical sympathetic has been practised by Jonnesco,[1] of Bucharest, in two cases of exophthalmic goitre. In one case the exophthalmos disappeared, in the other it almost disappeared. According to him, the complications which ensue from the excision of the superior cervical ganglion soon disappear.

My experience being limited to this case, I would refrain from commenting upon the opinions of many leading ophthalmic surgeons as to the advisability and success attending the operation of tarsorrhaphy, were it not for the views already expressed by Jessop, who believes it to be a futile operation. In this case I performed it with a full conviction of its merit, and believed at the time that I should at least save one eye if not both. Aware of Jessop's views, I took every precaution to perform the operation thoroughly, and though I only did a median tarsorrhaphy in the left, it was in length at least twelve millimetres. If I had done the complete operation, I have no doubt in my mind that it would have failed.

The proptosis, though very decided, was not excessive on either side; the appearance was rather that of spasmodic retraction of the upper eyelids. I have seen far greater proptosis from other causes without difficulty in the closure of the eyelids. Even after the eyes were excised the patient could not properly close her eyelids, and for some time after the operation the swollen conjunctiva was exposed.

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[1] *Annales d'Oculistique*, 1897.

# THE USE OF HOLOCAINE IN OPHTHALMIC PRACTICE.*

By James Hinshelwood, M.A., M.D.

Surgeon to the Glasgow Eye Infirmary.

Of late years several new drugs have been introduced into ophthalmic practice as substitutes for cocaine. Of these the most recently discovered, holocaine, has been the subject of considerable attention, chiefly in Germany and France, since its discovery by Täuber in the beginning of 1897. The first communication regarding it will be found in the *Centralbatt für praktishe Augenheilkunde*, January, 1897, where Prof. Hirschberg[1] of Berlin gives a short note regarding his experiences with a new drug as a substitute for cocaine. This new drug had been given to him for trial by Dr. E. Täuber, privat-docent of chemistry in the Technical High School of Berlin. Prof. Hirschberg remarks in his note, that a few drops of 1 per cent. solution of this drug rendered the eye insensitive within half to one minute, so that foreign bodies could be removed from the cornea without pain. He also observed that it did not dilate the pupil, and that it could be boiled.

This brief communciation was rapidly followed by more detailed and elaborate observations by Täuber,[2] Kuthe,[2] Gutmann,[3] Heinz,[4] Schlösser,[4] Winselmann,[5] Hirschfeld,[5] Loewenstamm,[6] Berger,[7] Lagrange,[8] Cosse,[8] and Natanson.[9]

All these observers, whilst differing in matters of detail, are agreed that holocaine hydrochloride can be substituted with advantage for cocaine hydrochloride as a local anæsthetic in ophthalmic practice,

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* Read before the Ophthalmological Section of the British Medical Association, Edinburgh, July, 1898.

by reason of certain decided advantages which it possesses over cocaine. I have thought it might prove interesting to those who have not yet tried this new anæsthetic to hear a brief account of its qualities and the experience of one who has used it.

For detailed information as to the chemical constitution and pharmacological value of holocaine, I would refer to the articles by Täuber[2] and Heinz.[4]

In the first place holocaine is a derivative of phenetidin, from which also are derived phenacetin and lacto-phenin. It is a strong base, insoluble in cold water, but readily soluble in alcohol and ether. The hydrochloride of holocaine, which Täuber proposed as a local anæsthetic for the eye, takes the form of white needles, slightly soluble in warm water. Its aqueous solution is neutral and undergoes no change on prolonged boiling. A 1 per cent. aqueous solution of the hydrochloride of holocaine is the form in which the drug has been used by all the authors above referred to, and by myself. Täuber, in his original paper,[2] calls attention to a most important point, that the solution must be prepared and preserved in a vessel absolutely free from any trace of alkali, otherwise it becomes muddy from the precipitation of the base. In order to prevent this precipitation and consequent weakening of the solution, it must be prepared and preserved in vessels of porcelain or of glass, which have undergone a preliminary process of dealkalinisation. This is easily accomplished by putting the glass bottles in a weak solution of hydrochloric acid and boiling them from half an hour to an hour.

It has been stated by some writers that the salt is soluble to the extent of 2½ per cent. in cold water, but Mr. John McMillan of Glasgow, the chemist who has prepared all my solutions, informs me that in order to get a clear aqueous solution of holocaine hydrochloride of the strength of 1 per cent., it must be prepared with

the greatest care. The following are his recommendations for the preparation of the solution. Freshly distilled water should always be used, as when the distilled water has stood for any length of time it often gives a muddy solution. The solution is more easily made with the water moderately warm, but it must not be too hot, as the salt is liable to crystallise out again on cooling. The best way to procure a clear solution of the requisite strength is first to rub down the salt with a few drops of warm freshly distilled water, and afterwards gradually to add the requisite quantity of warm water. The solution thus prepared is perfectly clear and will remain so for a very considerable time. All the glass vessels and bottles used in the preparation or storage of the solution must be dealkalinised by boiling them in a weak solution of hydrochloric acid from half an hour to an hour.

Before using it for operative purposes or in the diseased eye, I made a large number of observations on the effect of the instillation of a few drops of the 1 per cent. solution into the normal eye. My observations as to its action and effects were in harmony with those previously made by the observers already quoted, and of these the following is a brief summary :—

There is immediately after instillation a slight feeling of burning and also a slight hyperæmia of the bulbar and palpebral conjunctiva. Both of these symptoms are very transient and pass away rapidly.

There is complete anæsthesia of cornea and conjunctiva, produced in from fifteen to thirty seconds after instillation, and lasting from five to ten minutes.

There is no alteration in the size of the pupil, no disturbance of accommodation and no change in the tension of the globe.

The corneal epithelium, even after repeated instillations, retains its normal appearance, remaining smooth, moist and glistening.

Two or three drops of a 1 per cent. solution are quite sufficient to produce complete anæsthesia.

To put it concisely, holocaine seems to have no other effect upon the eye than rendering it anæsthetic, and herein lies one of its advantages over cocaine. It will also be observed that the anæsthesia produced by holocaine is more rapid in its onset and lasts longer than that produced by cocaine. If you instil into one eye two or three drops of a 1 per cent. solution of holocaine, and into the other a similar number of drops of a 2 per cent. solution of cocaine, you will find the holocaine will produce complete anæsthesia in half the time taken by the cocaine, and further, that the anæsthesia produced by the holocaine will last nearly twice as long as that produced by the cocaine.

Let us now examine our experience with this new anæsthetic in ophthalmic practice.

I have habitually used it during the last eight months in the case of inflamed eyes, such as conjunctivitis, phlyctenular affections, ulcers of the cornea, &c., in order to soothe the patient, to relieve pain and blepharospasm and so admit of a more exact examination of the eye. I have found holocaine very efficacious for this purpose and particularly useful in hospital practice, where owing to the large number of patients requiring to be seen, its rapidity of action leads to a very considerable saving of time. In the examination of inflamed eyes with photophobia and blepharospasm, a few drops of the 1 per cent. solution will enable you within a few seconds to get a good view of the cornea. I have used it also frequently for little manipulations, such as the application of nitrate of silver or sulphate of copper to diseased lids; when within a few seconds of the instillation of the drops, the application could be made with comparatively little discomfort to the patient. It has been claimed for holocaine by some observers, and espe-

cially by Lagrange and Cosse,[8] that when the conjunctiva is inflamed and its vessels engorged, its anæsthetic effect is much more profound than that of cocaine. My experience does not harmonise with such observations. It is a familiar fact that when the conjunctiva is inflamed, cocaine acts more slowly and much less powerfully than in the normal conjunctiva, probably because the engorged condition of the vessels is an obstacle to the absorption of the drug. If holocaine in such cases gave a profounder anæsthesia, it would be a signal advantage. I made numerous observations with a view to testing this point. As the sensation of pain is a purely subjective symptom, its apparent intensity will vary with different patients. A similar operation in two different patients may be performed, on one with comparatively little discomfort, whilst on the other it may cause apparently much suffering. Hence when the lids of both eyes had to be touched with nitrate of silver or sulphate of copper, the method was adopted of instilling into one eye a few drops of the 1 per cent. holocaine solution and into the other a few drops of 2 per cent. cocaine solution, and noting if the patient experienced less discomfort in one eye than in the other. In most cases the patients said there was no difference whatever. A few stated that the holocainised eye was less painful, while others made the same statement regarding the cocainised eye. As a result of these observations it was evident that there was no pronounced difference between the intensity of the anæsthesia produced by the holocaine and that produced by the cocaine. The only difference was in their rapidity of action, the holocaine acting in about half the time of the cocaine. I had an excellent opportunity of further testing this point as to the action of holocaine in the inflamed eye, on three cases of hypopyon ulcer, where paracentesis of

the cornea had to be performed several times in succession. In these cases holocaine and cocaine were used alternately for the successive operations, but without exception these patients expressed themselves as feeling no greater relief with the holocaine than with the cocaine.

Although I have not had an opportunity of trying it, I would suggest that holocaine will be particularly useful as a sedative combined with eserine to relieve the painful attacks of glaucoma. Cocaine has been advocated for this purpose by Groenouw of Breslau and others, but I am certain that its use is attended with great danger in such cases. In my own experience, I have seen a severe attack of acute glaucoma coming on immediately after the dilatation of the pupil with a 2 per cent. solution of cocaine. In holocaine, we have an anæsthetic which neither elevates the tension of the globe nor dilates the pupil and hence is specially fitted for the treatment of such cases, having all the pain-relieving qualities of cocaine without its dangerous effects.

I have used the 1 per cent. solution of holocaine hydrochloride as the anæsthetic in 198 cases of operative interference.

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|---|---|
| Removal of Foreign bodies ... ... ... ... | 124 cases |
| „ „ Chalazion ... ... ... ... | 15 „ |
| „ „ Cyst of Conjunctiva .. ... ... | 1 case |
| Tenotomies ... ... ... ... ... ... | 7 cases |
| Muscular advancements ... ... ... ... | 2 „ |
| Pterygium ... ... ... ... ... ... | 2 „ |
| Hypopyon Ulcer, tapping anterior chamber ... | 3 „ |
| Capsulotomy and discission of secondary cataract | 5 „ |
| Iridectomy ... ... ... ... ... ... | 15 „ |
| Needling operation for soft cataract ... ... | 10 „ |
| Extraction of senile cataract ... ... ... | 14 „ |
| Total ... | 198 „ |

For the removal of foreign bodies from the cornea holocaine is an ideal anæsthetic. Two or three drops of the 1 per cent. solution will give within twenty or thirty seconds an anæsthesia sufficiently profound to enable the foreign body to be removed without the slightest discomfort. Even in the case of bodies difficult to remove, and therefore requiring prolonged manipulation, it is scarcely ever necessary to repeat the instillation.

In all the conjunctival operations the holocaine proved a most efficient anæsthetic. A few drops of the holocaine solution were instilled into the conjunctival sac; after twenty or thirty seconds an opening was made into the conjunctiva and two or three other drops allowed to fall directly on the conjunctival opening. In this way a very profound and prolonged anæsthesia was obtained, so profound indeed that frequently the operation could be completed without further use of the anæsthetic. This was particularly noticeable in the tenotomies, muscular advancements and the pterygium operations, which were performed with the expenditure of a very few drops of the holocaine solution and yet with perfect success as regards the anæsthesia produced.

In the operations in which the globe was opened, the holocaine acted equally well. The capsulotomies, discissions and needlings were absolutely painless. In the iridectomies, the holocaine had the very great advantage over the cocaine of not altering the size of the pupil. Whilst this is a decided advantage in every case of iridectomy, it is of very special value in operating on cases of glaucoma. In the cataract extractions the holocaine proved a most satisfactory anæsthetic and left nothing to be desired. In the extractions I instilled two or three drops of the solution, waited a minute and instilled two or three more

drops just before beginning. In none of my extractions did I require to use the anæsthetic again.

No toxic or any disagreeable effects whatever were observed in any of these cases, nor have any cases been reported so far, where toxic effects were observed. Heinz[4] has found by experiments on animals that holocaine is a poison of considerable intensity, producing convulsions, and analogous in its action to strychnine. He found its toxic action much more intense than that of cocaine or eucaine on hypodermic injection of the drug. In spite of this, the risks of toxic effects are not so great as with cocaine, so long as the solution is only dropped into the eye. A much smaller quantity of holocaine will produce complete anæsthesia of the eye. We use only a 1 per cent. solution of holocaine and two or three drops of this solution are sufficient. Besides the anæsthesia of holocaine being more prolonged than that of cocaine, if the anæsthetic effect requires to be kept up for some time, this can be accomplished with a comparatively small expenditure of the drug.

In view of the experiments of Heinz, I have refrained from using it hypodermically until we possess more definite knowledge as to the doses which can be employed with safety.

A very important quality of holocaine is that it is an antiseptic. Heinz has proved by experiments in the growth of micro-organisms, that a 1 per cent. solution has powerful bactericidal and antiseptic qualities, and maintains that boiling the solution to sterilise it is therefore quite unnecessary.

Let us in conclusion review briefly the advantages of the new anæsthetic.

Holocaine is undoubtedly a most valuable agent for the production of anæsthesia of the eye. It produces an anæsthesia at least as profound as that of cocaine, with the additional advantages of beginning more

rapidly and lasting longer. Its peculiar value lies in the fact that, apart from the anæsthesia, it seems to have no further effect on the eye whatever. It seems to act simply by paralysis of the sensory nerve endings and has no other action on the eye, leaving the pupil, accommodation and tension quite unaffected. Cocaine not only causes anæsthesia but contraction of blood-vessels and stimulation of the sympathetic, thus producing many changes in the eye, such as dilatation of the pupil, paresis of accommodation, pallor of the conjunctiva, a widening of the palpebral fissure, diminished frequency of the act of winking and sometimes desiccation of the corneal epithelium. These secondary effects of cocaine are not only undesirable but sometimes positively injurious, as where in my own experience an acute attack of glaucoma followed the use of cocaine. It is therefore greatly in favour of holocaine that it seems to have no effect on the eye apart from the production of anæsthesia.

A further point in favour of holocaine is its antiseptic properties, which according to Heinz are so powerful, that boiling the solution to sterilise it is quite unnecessary.

The price of holocaine hydrochloride and the cocaine hydrochloride is at present the same. Whilst the cocaine salt, however, fluctuates in price according to the supply, the probability is that the holocaine salt will decrease in price as it becomes more widely used, since it is synthetically prepared, and therefore can be produced in any quantity. For hospital practice it is advantageous, as far as price is concerned, to use the new anæsthetic, since the 1 per cent. solution of holocaine is equal in its effects to a 2 per cent. solution of cocaine, and further since even less of this 1 per cent. solution requires to be used. From the economic point of view, therefore, its advantages over cocaine are decided.

I would specially impress on those intending to try holocaine the necessity of attending to all the precautions already mentioned in order to ensure a clear aqueous solution of the full strength of 1 per cent. If these precautions are not taken, a muddy solution is the result. This muddiness is due to precipitation of the holocaine base, whereby the solution is weakened and consequently its anæsthetic effect is considerably impaired.

It is evident from these observations that in holocaine the ophthalmic surgeon will find an agent for the production of anæsthesia of the eye, which has many decided advantages over the anæsthetics which are now commonly in use.

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# THE LOCAL USE OF COCAINE CRYSTALS IN OPHTHALMIC SURGERY, IN PREFERENCE TO THE SOLUTION.[1]

By ADOLPH BRONNER, M.D.

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COCAINE, as a local anæsthetic, has been in use for a number of years. In no branch of surgery is it more largely used or are its effects more marked and useful than in ophthalmic surgery. For most operations in the eyeball we generally use a $2\frac{1}{2}$ per cent. solution of the hydrochlorate of cocaine, which is applied several times. For strabismus operations a 2 to 10 per cent. solution is often injected under the conjunctiva. The great drawbacks to this method are, that toxic effects often follow, and that the parts become so distended and altered that operative treatment is rendered more difficult.

For most operations of the palpebral or ocular conjunctiva, such as application of the galvano-cautery for granular lids, removal of granulations after enucleation, I use the cocaine crystals in preference to the solution. In many operations in the eyeball the application of the $2\frac{1}{2}$ per cent. solution suffices, *e.g.*, for discission of the lens-capsule or extraction of lens following iridectomy. But for all operations where a more complete and deep-seated anæsthesia is necessary (such as iridectomy, especially in cases of glaucoma, extraction of lens without iridectomy), the cocaine crystals are more efficacious. In the latter cases not only is the pain caused by the passage of the lens through the pupil less severe when the crystals are used, but what is of greater importance, there is less tendency to

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[1] Read before the Ophthalmological Section of the British Medical Association, Edinburgh, July, 1898.

spasm of the ocular muscles, and consequent loss of vitreous or prolapse of iris. These are, as we know, the chief objections to extraction without iridectomy.

About $\frac{1}{4}$ up to 1 grain of the hydrochlorate of cocaine is applied to the corneo-scleral region where the incision is to be made. The eyelids are kept open for a few seconds and then closed for four to five minutes. I also use the crystals in cases of ulcer of the cornea when the galvano-cautery is applied, or when there is prolapse of the iris and this has to be removed. In cases of tenotomy or advancement of the recti muscles, the operation is rendered practically painless if we use the cocaine crystals. An incision is made through the conjunctiva and subconjunctival tissues, and the cocaine placed on the parts to be operated on. I have also used the crystals in several cases of enucleation. As the crystals cause rather severe burning pain it is advisable to first use a weak solution of cocaine. I have never seen any toxic effects. The action of cocaine is not consistent, and its intensity seems to vary, not only with different individuals, but also with the same individual at different times. We can, therefore, not always rely on the statements of the patients as to the exact amount of pain which is felt. It has been asserted by some that a $2\frac{1}{2}$ per cent. solution of cocaine induces complete anæsthesia, and that no better results can be attained by the use of a stronger solution or of the crystals. In my experience, however, this is not the case, and I have brought the subject before you in the hope of obtaining the opinion of others who have tried the different strengths of cocaine solution and the crystals.

**M. ABADIE. Intra-ocular Hæmorrhages in Adolescents.** *Archives d'Ophtalmologie, July*, 1898.

At the meeting of the Société française d'Ophtalmologie, Abadie read a paper dealing with the various forms of intra-ocular hæmorrhage which occur in adolescents, remarking that these differ from those which are found in older persons in etiology, in their nature, and in the treatment which is appropriate. He divides them into four classes:—

(1) *Sudden and Recurrent Hæmorrhages.*—In the patients in whom these occur—generally equatorially—epistaxis is a frequent symptom, and in fact the hæmorrhages have been styled by Panas, not unhappily, as intra-ocular epistaxis, and appear to be closely related to the changes which the organism undergoes about that period of life. The best remedies for this condition, which is generally benign, are good hygiene and tonics, such as quinine and iron, citric and sulphuric acids, and ergotine.

(2) *Hæmorrhages connected with Dyscrasia.*—Here the onset is somewhat insidious and gradual, and one rarely has the opportunity of seeing the patient at the beginning of the malady, for he generally presents himself with diminished vision, and with a vitreous humour turbid and non-transparent if not actually opaque. But when one does have the opportunity of observing the disease in its early stages, fine streaks of blood may be seen showing themselves along the line of the retinal vessels. These streaks are at first isolated and discrete, but by-and-bye extend to larger dimensions, and increase in number, involving first the macula and papilla and the course of the veins. The blood, which in the earlier stages lay on the surface of the retina, now breaks into the substance of the vitreous humour, and at a later period the vitreous, broken up by these strands and membranes formed of blood clot, begins to degenerate. As a rule there are no symptoms to draw attention to these recurrent hæmorrhages; there is neither pain nor conjunctival injection, and the tension remains

normal; the pupil continues to react to light. These cases are often wrongly diagnosed as detachment of the retina, but it is very rare in detachment for the vitreous to become so turbid and opaque as when hæmorrhages have occurred. In detachment, too, there is an area of the field in which vision is quite lost and pupil reaction also; this is not so in cases of hæmorrhage into the vitreous. The fact that neither alterations of vessels nor of general circulation are to be found in those patients, and also the remarkably beneficial results which treatment directed to the improvement of the blood condition brings about, seem to justify the name applied to this variety. Apparently the most suitable remedies are citric and sulphuric acid, "lemonade" perchloride of iron, ergotine, and above all quinine; local depletion is useful also. Under this heading also may be included hæmorrhages which are apt to occur intra-ocularly in certain transitory predisposing conditions, to which is added some mechanical causes, *e.g.*, pregnancy, hæmophilia, phosphaturia, pernicious anæmia, malaria, influenza.

(3) *Intra-ocular Hæmorrhages in Cases of Choroido-Retinitis.*—The presence of choroido-retinitis patches in some district or other of the fundus serves to fix the diagnosis. The complication of hæmorrhage is a very serious one, and treatment should be directed to the original malady. Subcutaneous injection of soluble mercurial salts seems to answer best, with local depletion and the administration of ergotine and quinine.

(4) *Apoplectiform Retinal Hæmorrhages.*—These are to be considered as of very grave signification, and as pointing to approaching loss of the eye. In certain of the other varieties the blood breaks out of the tissue into the vitreous humour; here the effused blood infiltrates the choroidal and retinal tissue and produces there great disorganisation with consequent very unfavourable outlook. Abadie regards this flooding of the tissue with blood as a pathognomic sign. From the deep-lying tissue, too, the exuded blood finds its way even to the iris tissue, which then loses its brilliant structure and becomes dull-looking, with

reddish sanguinolent streaks staining it. The pupil is generally somewhat dilated, and the tension raised, while the pains, at first localised to the eye, spread over the head and take on the character of glaucoma pains. These hæmorrhages are due, according to the author, to the rupture of vessels which have undergone excessive distension. The heart and great vessels are always normal, and the disease is confined to one eye. The pains spreading over the area of the fifth nerve and the vaso-dilator nerves which accompany it, which indicate the presence of an irritative process in these nerve trunks, and the phenomena of glaucoma which often follow, are all due to an excitation of vaso-dilator twigs, a fact which is borne out by the benefit derived from the use of quinine and myotics, both of which tend to cause constriction of vessels. Quinine seems to have a special power over the vessels of the retina and the eye generally, as is shown in cases, for example, of quinine poisoning, where the vessels become reduced to mere threads. The author believes that by pushing it vigorously mitigation of pain, clearing up of the media and lowering of intra-ocular tension may be brought about, but it is well in addition to use blood-letting and myotics. " By these means one can sometimes succeed in preventing fresh excessive hæmorrhages into the globe which would have necessitated enucleation of the eye ! "

It is thus seen that Abadie regards these hæmorrhages as not by any means necessarily due to cardiac or vascular disease, but rather due to a pathological condition of the nerve elements presiding over the vessels. In short, he traces these evils to the sympathetic system from which evils take their rise, resulting in hæmorrhages which may destroy vision, or should they happen to occur elsewhere, produce various paralyses or death.

W. G. S.

**PROF. S. BAUDRY (Lille). Simulation of Blindness Complete and Partial.** *Pp.* 71.

This pamphlet [of seventy pages] gives an exhaustive account of the chief methods for the detection of pretended amblyopia, which are many and various. The writer divides the "patients" into two classes according to their power of deception thus: in the first class the simple and ignorant; in the second the "knowing ones." The former, who have no knowledge of how to act the part, and who are quite uninstructed in the methods which will be taken to investigate their cases, are easily enough detected. The second class, who may have been through the hands of several surgeons already, and at each *séance* have acquired a fresh trick with which to prolong the period of uncertainty in the mind of a new examiner, are much more difficult to deal with, and it is chiefly to supply an account of the means which may be employed for their detection that the book is written. In our experience, persons in the first of these classes are apt to find their way gradually into the second. It is unnecessary at present to follow M. Baudry through the scheme of pitfalls with which he furnishes us, and of each of which he gives the authorship; and in regard to his own special plan for detection it is only needful to refer to the January, 1898, issue of this Journal, in which a full account is given of the ingenious prism which he suggested, and which seems well calculated to surprise even the wary simulator into damning error. After all, with your real simulator, all one generally needs is a little patience, a prism or two, and a high convex lens; elaborate apparatus, stereoscopes, &c., are rarely of much use. If one takes a little time and varies the tests he will stumble sooner or later, though a quick-witted and intelligent swindler may give a good deal of trouble. But in our experience the men who are difficult of detection are two—he who has a lesion which may cause a certain amount of amblyopia, but who "claims" to be worse than appearances seem to justify; and he who, having

received an injury, may be either voluntarily or "hysterically" exaggerating its effects—it is sometimes extremely difficult to say which, for the fact that he sees better than he says he does, does not necessarily prove him to be a cheat; he may be merely hysterical. The passing of the recent Workmen's Compensation Act demands that careful attention be given to elucidate such cases, as there is a natural temptation to make the most of an injury under the circumstances. It is not very easy to give rules in cases of traumatic hysteria, but Baudry deals with the question in a few pages. Probably his experience has lain much more among those whose peaceable natures are averse to enforced service in the army, and who do not so frequently belong to the class just indicated. Nor does he deal with a form which imposture sometimes takes, and which is very difficult of detection at times, viz., simulated night-blindness. Sometimes a soldier belonging to a regiment ordered for colonial or foreign service will complain of this condition—it is rare among civilians—and as this peculiar condition is sometimes unaccompanied by any visible fundal alteration, he may manage to escape detection.

The little *brochure* will well repay perusal; we might suggest the addition of a few reports of cases in any subsequent addition.

W. G. S.

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THOMAS JONNESCO (Bucharest). Treatment of Glaucoma by Resection of the Cervical Sympathetic. *Press Médicale, June* 8, 1898.

Jonnesco is an advocate for resection of the cervical sympathetic in cases of glaucoma, an operation which he performed for the first time for this purpose in September of last year, and to which he has had recourse seven times since. Most of these cases are sufficiently far advanced to allow one to judge of the ultimate result of the operation in Jonnesco's opinion, and of each of them he gives a brief

account. To sum these up, he has operated once for acute glaucoma, once for chronic irritative glaucoma, three times for chronic irritative absolute glaucoma, twice for simple chronic glaucoma; and the results may be placed thus: (*a*) immediate and permanent reduction of the ocular tension in every case; (*b*) marked or even extreme permanent contraction of the pupil, and that even in cases in which previously an iridectomy had been performed; (*c*) disappearance of any periorbital pains and headaches; (*d*) cessation of attacks in the irritative cases; (*e*) decided and permanent improvement in vision in all cases in which there was not complete blindness before operation; this beneficial effect has been remarkable also in that the amelioration of vision has been not merely immediately great, but progressive also. In presence of results so noteworthy, it is necessary to seek to discover how it is that resection of the sympathetic can influence glaucoma. It may fairly occur to the reader to ask whether it would not have been well before proceeding to so serious an operation as this to consider that question as a preliminary, but Jonnesco seems to work on a different plan. "The pathology of glaucoma," says Panas, "and the beneficial action thereon of iridectomy can be explained only when we know more perfectly the action of the nervous system on the intra-ocular secretion and on intra-ocular tension; then perhaps a new treatment for glaucoma may be established upon a scientific basis." Many observers have sought this knowledge. Donders regarded increased tension as having a neuro-secretory origin, and laid the blame upon the third nerve; section of that nerve would cause a lowering of tension, while section of the sympathetic in the neck would have no important effect upon it, but later investigations have shown that the precise contrary is the case. It has been found that after section of the sympathetic the blood-vessels of the eye dilate, the blood thus circulates under lower pressure, and the intra-ocular secretion becomes lessened in amount, an alteration which is sufficient to neutralise the increase of tension which the mere dilatation of vessels would otherwise

produce. Others give a somewhat different explanation of these results. Let these be as they may—and certain of these theories and observations are contradictory one of another—the crude but comforting fact remains that in all Jonnesco's cases removal of the superior cervical ganglia was followed by diminution of tension, not always very great in degree, but never absent altogether. This fact he attributes to the removal of the ocular fibres of the sympathetic, which, taking their rise in the brain and cord at different heights, pass through this ganglion before being distributed to the eye. These fibres, as one knows, terminate in the iris, ciliary muscle and muscular apparatus in Tenon's capsule, and excitation of them from any cause produces dilatation of the pupil, contraction of the intra-ocular vessels, contraction of the unstriped muscle fibres surrounding the globe, and probably increase in the quantity of aqueous humour, with increased difficulty in its removal—glaucoma in fact. Removal of the cervical ganglia then, and these fibres along with them, destroys these vaso-constrictor twigs to the eye, whence occurs relaxation of vessels, diminution of tension and of secretion, contraction of the pupil, a wider opening of the angle of the anterior chamber, relaxation of the unstriped muscular fibres, and thus reduction of the pressure upon the veins which carry off the blood from the interior of the eye, and the relief of the pressure in the intra-ocular veins. Jonnesco considers that the real origin of the nerve troubles which produce the phenomena known as glaucoma is central, not peripheral; it consists in an excitation of the intra-cranial or medullary centre, whence arise the fibres which, traversing the superior cervical ganglia, are then distributed to the eye. Removal of these ganglia, then, does not remove the place of origin of the disease, but completely cuts off their path.

It is necessary, in order properly to determine in what cases to employ this method of treatment, to select those in which the nervous element in the cause is most marked. Apparently to judge from the cases just reported the operation in chronic simple glaucoma and chronic irritative

glaucoma without prodromal period gives better results than in those forms in which acute attacks or variable conditions with prodromal symptoms are present, because in the former the nerve element is not mixed up with another inflammatory or sub-inflammatory element on which operation on the sympathetic can have but little effect. In point of fact Jonnesco considers that his somewhat heroic treatment is more particularly suitable for those forms of glaucoma in which iridectomy is least efficient, those, namely, in which quiet chronicity without congestive attacks is the main feature, and thus the two operations cover the whole ground of glaucoma.

Dealing next with the mode of performance of the operation, he says there can be no doubt as to which of the ganglia to remove, since it is through the superior that practically all the fibres to the eye pass. He does not consider that mere section of the cord below this level would have the desired effect, since so many of the nerve fibres would escape division were this operation—itself difficult of performance—attempted, and besides, the ganglion would transform itself into what one might call a peripheral (sub-) centre from which glaucoma-producing impulses might still proceed. Into the precise details of the operation it is not necessary to enter here. The more "general" phenomena produced by the operation are slight and temporary, but there are congestion of the face, eyes and nose, tears and nasal secretion flow rather freely, there is a feeling of weight in the head too, which passes off after a day or two, contraction of the pupil; retractation of the eye into the orbit and ptosis may be noticed. As regards therapeutic results, he says the improvement in vision may be immediate or delayed a few days, and goes on advancing; headache disappears, though for some time, as just indicated, there is apt to be a feeling of dull discomfort in the head, due no doubt to the cerebral congestion entailed by the operation; there is apt to be a small degree of dysphagia for a few days. It is indeed a thing very much to be desired that one should be able to obtain better results in cases of chronic glaucoma, and

that one should have a more satisfactory mode of treatment, but we can hardly say that Jonnesco has provided us with a ticket of admission to the Elysian fields of ophthalmology.

W. G. S.

Upon the article of Jonnesco with which we have been dealing, Professor Panas made certain remarks which deserve attention on the occasion of the paper being presented to the Academy of Medicine (*Archives d'Ophtal.*, July, 1898). As regards the matter from a physiological point of view, M. Jonnesco has been somewhat hasty, for though the reduction of tension produced on division, and still more on resection of the sympathetic is real, it is quite temporary, and vanishes after a very short period, leaving behind the myosis, however, which appears to be more permanent. Panas saw a patient three months after he had had this operation performed for the cure of glaucoma, and found that not merely was vision still declining, but that one eye which had possessed normal tension at that period had now become distinctly harder, while there was also amblyopia and contracted field. Jaboulay, who has had much experience of the operation in connection with exophthalmic goitre, feels himself obliged to admit that the effects are apt to be but temporary, and recurrence then is established. Again, the purely hyper-secretion theory of glaucoma as enunciated by von Graefe is not accepted to-day, and the narrow gate of exit theory is more readily credited in connection (or not) with the former hypothesis. Now, it is not easy to see what relation M. Jonnesco's operation has with the new pathology of glaucoma. And on the whole the cases reported on are as yet too recent to be regarded as "finished." M. Panas does not see his way to adopt the operation in question.

W. G. S.

# OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Mr. H. R. Swanzy, President, in the Chair.

Thursday, July 7, 1898.

*Subconjunctival Blood-letting for Hæmorrhagic Retinitis.*—Mr. Richardson Cross read a paper on Subconjunctival Blood-letting for Hæmorrhagic Retinitis. Recognising the fact that a considerable amount of blood escaped from the wounded vessels in squint and other subconjunctival operations without any ill-effect, Mr. Cross determined to try the effect upon intra-ocular hæmorrhage or congestion, of a more or less free division of the blood-vessels running along the muscles and in the subconjunctival tissue. For this purpose he made free incisions beneath the conjunctiva either between the inferior and internal recti or between the superior and external recti; the incisions were followed by the use of hot fomentation. From the result of this kind of interference in several cases Mr. Cross felt justified in recommending this plan of abstracting blood from the branches of the ophthalmic artery. In one case in which there were numerous retinal hæmorrhages round the disc, with much congestion of the retinal vessels and some optic neuritis, leeches and general medical treatment had been applied without benefit and vision was reduced to $\frac{6}{60}$. Free incisions were made into the subconjunctival tissue with strabismus scissors so as to lacerate as many vessels as possible and warm fomentations were afterwards applied. The next day the pupil was dilated and there was marked diminution in the swelling of the disc, with an improvement in vision. This improvement was steadily maintained and the vision was eventually completely restored. Several other cases were quoted in which considerable improvement resulted.

*The Mechanism of the Conjugate Movements of the Eye-balls.*—Dr. Aldren Turner read a paper on the Mechanism of the Conjugate Movements of the Eyeballs. He showed that

there was accumulating evidence in favour of the sixth nerve nucleus being the lower or pontine centre for the associated action of the internal and external recti muscles, and that the fibres from the sixth nucleus of one side probably passed directly into the third nerve of the opposite side, without the intervention of cells in the third nucleus, facts which indicated that the internal recti were doubly innervated—on the one hand from the third nucleus for convergence and on the other from the sixth nucleus for lateral movement. Respecting the path by which impressions were conveyed from the cerebral cortex to the sixth nucleus, he referred to an experiment in which the tegment of the pons was divided without interference with the sixth nucleus. As a result conjugate deviation of both eyes to the opposite side, with inability to move them to the side of the lesion, was observed. The conclusion drawn from this observation was that the cortico-pontine fibres decussated in the neighbourhood of the quadrigeminal bodies and passed downward in the tegment of the pons to the sixth nucleus.

The President made some observations on the position of the nuclear centre for convergence, and on the probability of there being not one but several cortical centres for conjugate movements of the eyes.

Mr. Jessop thought that absence of convergence was a very rare condition; he knew of only one case in a boy subject to epileptic fits. He had advanced both internal recti with the result that the boy now had several metre angles of positive convergent power.

In reply, Dr. Turner stated that he had only seen one case of paralysis of convergence, while the conjugate movements were unaffected. He referred to the loss of pupillary contraction on attempts at convergence in that case, while the pupillary light reflex was retained. This phenomenon was the converse of the Argyll-Robertson pupil.

*Large Clear Cyst of the Conjunctiva.*—Mr. Simeon Snell (Sheffield) related particulars of a case of large clear cyst

of the conjunctiva. The cyst was as large as a hazel nut; it was concealed almost entirely by the lower eyelid, but when the lid was drawn down it bulged forward. The patient was twenty-three years of age; the cyst had been noticed since childhood but was then quite small. Ten months before coming under observation he was struck over the cyst, which enlarged and became bluish in colour; before this it was transparent. Microscropical examination of the cyst, made by Mr. Treacher Collins, showed it to be lined throughout by a single layer of endothelial cells, outside which was some moderately dense fibrous tissue with patches of round-celled infiltration in it. The cyst was probably lymphatic in origin.

*Chancre of the Lacrymal Sac.*—Mr. Simeon Snell also related a case of chancre of the lacrymal sac. The patient sought advice for what he deemed subacute inflammation of the lacrymal sac. When seen there was no ulceration of the sac, but there was a more than usually defined margin to the swelling. There was nothing to suggest a primary lesion. Later the canaliculus was slit up and the duct probed with some slight relief; afterwards a macular syphilide appeared on the chest and arms with ulceration of the tonsils. Presuming the lesion of the lacrymal sac to be a primary sore, the secondary symptoms appeared in correct sequence as to time, the first swelling of the sac being noticed on April 3, and the rash appeared on May 13. The thickening of the sac and the rash quickly dispersed under mercurial treatment.

*Living and Card Specimens.*—Mr. Richardson Cross: Plastic Operation for Contracted Socket.

Mr. Ernest Clarke: Pigmented Mole of the Face and Eyelids.

Mr. Adams Frost: Case of Pseudo-glioma.

Mr. Marcus Gunn: Preparation of a Sclerosed Retinal Artery.

# THE DEVELOPMENT OF THE OPERATIVE TREATMENT OF SQUINT.[1]

By Professor Snellen, Utrecht.

There are at present two currents of opinion as to the operative treatment of squint. Some ophthalmologists desire to confine the treatment, as much as possible, to the simple tenotomy, as much for the sake of their own convenience as to avoid discomfort to the patient; the result of the latter method is that, whilst cosmetically and functionally satisfactory results may be obtained, it must be admitted that more or less sacrifice of lateral mobility may counterbalance these advantages.

Others maintain the conviction, and lay down the rule, that no sacrifice of mobility ought ever to be allowed, where such can be prevented by a more radical method of operating.

Even a simple hypermetropic strabismus, with superfluous muscular function, requires, according to their standpoint, an advancement or shortening of both external muscles; and they are not discouraged either by the greater difficulties of the operation, or by the requirements of a troublesome after-treatment, with bandaging of both eyes, sometimes for more than a week.

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[1] Read at the meeting of the British Medical Association, Edinburgh, 1898.

This controversy may offer a reason for my asking your attention to a review of the development of these contradictory tenets.

The operative treatment of strabismus was begun not so long ago, the first operation having been performed by Dieffenbach on December 20, 1839, at 3 p.m. I repeat here Dieffenbach's statement of date and hour, because it expresses the feeling of importance he attached to this attempt of curing squint, which at that time was a perfectly new experiment. Only Strohmeyer had heretofore shown its possibility, and demonstrated it on the cadaver. Since then, the operation has been followed by thousands and thousands.

"I confess," says Dieffenbach, "that the success of this first attempt of operating for squint was the greatest scientific satisfaction I ever have experienced." But Dieffenbach knew that time and experience are required before new procedures reach perfection.

We read in the preface of his work: *Ueber das Schielen und die Heilung desselben durch die Operation* (1872): "This method of curing strabismus by operative treatment has now been in force for three years, but, after thirty years have passed, people may look with pity on these experiments of mine, and my contemporaries." And indeed so it has turned out.

Dieffenbach's method consisted in simply cutting the muscle. The obtaining of an important cosmetic improvement was the immediate result. But, in a great many cases, it was soon followed by insufficiency, with increasing deviation in the opposite direction, "whereby the eye proved to be thoroughly delivered into the power of its opponent." And soon the operator had to endeavour to rectify, as Dieffenbach called it, "this unhappy result, most prejudicial to art, and bitterly disappointing to the patients."[1]

[1] l. c.

Dieffenbach himself, Jules Guerin, and finally v. Graefe, experimented with a view to discovering in what way this evil could be remedied. The first method of secondary operation consisted in detaching the cut muscle and rotating the bulb inwards, and maintaining it in its required position by means of sutures, which were inserted into the tendon of the antagonistic muscle, and then fastened over the nose with strips of plaster.

Both Boyer in France, and v. Graefe in Germany, pointed out, and v. Graefe proved experimentally, that not the muscle, but its tendon, had to be divided. For if the latter were divided close to the sclerotic, excessive retraction would be prevented by the connection of the tendon with Tenon's capsule.

All later methods of operating for squint are based on the principle that the tendon has to remain in connection with this capsular tissue.

Where the tendon is loosened too much, there is always a chance that a divergence and insufficiency of the internal muscle may occur.

There is another cause by which this insufficiency may be produced, viz., that if the surrounding tissue be too much injured, an adhesive inflammation may ensue by which a part of the tendon farther back, or the muscle, will become fastened to the globe.

The functional power of the muscle is dependent on the length of such a part of it as has a free movement. And the greater the recession towards or beyond the equator of the eyeball, the more limited will be its movement.

All oculists who have performed a great number of tenotomies must sometimes, in the same way as Dieffenbach, although in a smaller degree, have met with the accident of producing an insufficiency of the cut muscle, or even a deviation to the opposite

direction. It is these accidents that have induced some operators to replace tenotomy by advancement or readjustment of the antagonistic muscle.

These operations are certainly more radical, and are decidedly preferable, not only in the already mentioned cases of secondary divergence, but also in some of the cases where congenital or acquired paretic strabismus exists.

Different methods for advancing the retracted or paretic muscle have been recommended. These can be classified under two divisions : (1) Where the insertion of the tendon is to be attached to a more anterior part of the sclerotic ("re-adjustment," "avancement," "Vorlagerung,"), and (2) whereby the tendon is shortened by excision of a part of it ("tenectomy"). As the prototype of the first class, Critchett's "advancement" may be cited.

Critchett used to cut the tendon close to the sclerotic, and intended to fasten it near the margin of the cornea. In order to prevent the tearing of the conjunctiva, he passed a needle through a fold of the conjunctiva, and bound this up in a bundle. By this precaution he lessened the chance of tearing the conjunctiva ; but hereby another disadvantage arose : two knots of sutures lay immediately on each other, viz., the knot that bound the conjunctival fold, and on the top of this the knot that embraced the tendon. This produced a grave difficulty in the removing of the sutures.

Lately I have found a way of avoiding this objection. I do not tie the suture that binds the fold of the conjunctiva into a knot, but simply pass the needle in the same direction twice through this fold. The bundle of the conjunctiva thus lies firmly in a loop, which can be undone only by cutting the thread at either side of the knot which involves the tendon. Other operators try to solve the matter by passing the sutures

through the episclerotic tissue or even through the sclera. This certainly will prevent the tearing through, but any injury to the deeper coats of the eyeball seems hardly free from dangerous consequences.

Schweigger has the credit of first having introduced an operative method by which the same effect is aimed at, but which consists in shortening the tendon. He excises a portion of the tendon close to its attachment to the sclera, and by passing sutures he gets wound-surface to wound-surface, which allows a direct union without the necessary demand of a cicatricial adhesion of the surrounding tissues.

Priestley Smith has improved this operation, and succeeded in limiting it to the excision of a part of the tendon, preventing, as much as possible, all further injury of the surrounding tissue.

His way of operating is in short as follows. An incision is made in the conjunctiva parallel to the margin of the tendon, and thereupon also in Tenon's capsule, in the same way as is done for the first stage of the English sub-conjunctival method of tenotomy. Through this opening he passes one blade of a flat forceps, sliding it underneath the tendon, whilst the other blade is closing on the outside of the conjunctiva. Thus tendon and conjunctiva are secured between the two blades of the forceps. Sutures are introduced on each side of the forceps, and knotted together after the tendon and conjunctiva, as far as they have been clasped between the two blades of the forceps, have been excised.

We have had the opportunity of repeatedly convincing ourselves of the value of this method, and found it thoroughly fulfil its object, of limiting the operative wounding to the tissue which must be excised, and avoiding any further cicatricial process such as necessarily would lead to an impediment of the free movement of the eye.

Both operations, the re-adjustment of Critchett, as well as the tenectomy of Priestley Smith, fulfil the demand of transposing the eyeball into the required position, and, in the meantime, to improve or to re-establish its mobility.

The first method—the re-adjustment—will above all come into consideration in cases of secondary operations, whereby injury or former surgical action has preceded a functional impediment of the muscle.

The latter—the tenectomy—will earn the preference where muscle and tendon are intact, but where there exists a relative insufficiency of the antagonistic muscle.

Both methods, however, incur the objection that they include surgical difficulties, and require exercise and experience on the part of the operator, whilst moreover the effect cannot easily be determined beforehand. And, besides, they require a long and troublesome after-treatment, after which injection and swelling of the conjunctival tissues sometimes remain during a considerable time.

Much easier and more within the reach of any operator is the simple tenotomy. We are convinced that in the majority of the cases of squint hereby a satisfactory result may be obtained. This is certainly the case in all spasmodic strabismus, as is found with hypermetropia, or with paresis of accommodation. But good results are also often obtained in cases of paretic strabismus, viz., where paresis has been the cause, but where in the lapse of time the mobility of the muscle has been restored, only leaving a wrong position of the one eye in comparison to the other.

Although the operation of tenotomy is far easier and simpler than the operations of re-adjustment or tenectomy, it will always require a considerable degree of accuracy and of consideration.

The bad results which have discredited tenotomy are for a great part to be imputed to faults of execution.

After Dieffenbach's myotomy had come to discredit, it was v. Graefe who replaced it by the tenotomy; and so far v. Graefe may be indicated as the second father of the squint operation.

In 1857, at my first visit to Berlin, I saw v. Graefe perform this operation in the following way. He made an incision into the conjunctiva parallel to the margin of the cornea; after this he loosened the conjunctiva, either upwards or downwards from its subjacent tissue, took the tendon on a blunt hook, and in the meantime he pushed Tenon's capsule in a fold under the tendon, and cut the latter with a pair of sharp-pointed scissors.

It then struck me that this way of doing it did not seem to give a satisfactory guarantee that the tendon would *equally* in both directions (viz., upwards and downwards) remain united with Tenon's capsule.

After comparing this operation with the English sub-conjunctival method, I have tried to operate in a somewhat different way. I make the incision of the conjunctiva in a meridional direction, conformably to the longitudinal axis of the muscle. The tendon is then taken hold of with forceps and incised, so that a button-hole is made in the middle of its extension, and with the application of v. Graefe's hook this incision is enlarged upwards and downwards. In order more easily to direct the blades of the scissors vertically to it, it is advisable to use a pair bent on the flat. Finally a suture is placed to unite the edges of the wound.

This operation is preferably done without chloroform, in order that its effect may be observed and modified when necessary. It causes little pain if only the cocainising is done sufficiently early to allow the anæsthetic to reach the subconjunctival connective tissue. Any further pain is principally ascribable to

the pressure of the speculum. I therefore prefer to dispense with the speculum, and have the lids held apart by an assistant. In doing this I find it advantageous to adopt the proposal of Miculicz, of Breslau, to let the assistant use sterilised netted gloves, which are aseptic, and in the meantime prevent any slipping of the lids. In the same way as in the re-adjustment it is an important point that care should be taken not to wound, any more than absolutely necessary, the tissues in the neighbourhood of the field of operation.

The insufficiency which may occur later is, in my experience, mainly attributable to the tendon becoming too much incorporated in the cicatricial tissue, whereby a shortening of the functionally active portion of the muscle is caused.

For the sake of completeness, it may here be mentioned that there is a form of strabismus that cannot be rectified by any of the above-mentioned methods. I have only lately become aware of the importance of this variety.

In looking over the literature of the subject I have found no mention of these cases in any handbook or monograph with the exception of v. Graefe's classical work, *Beitrag zur Lehre vom Schielen und von der Schiel operation* (*Archiv für Ophth.*, vol. iii.).

I refer to the deviation in the position of the eye, which is sometimes met with as the result of the adhesion of the eyeball to the orbital wall, which v. Graefe called strabismus fixus. I have seen in such cases of considerable deviation that tenotomy has had no effect. In the course of operation I have noticed that, even with the fixation forceps, it is impossible to rotate the eye into a proper position. On further examination one may observe that posterior to the equator, and usually to the lower and inner side, there exist adhesions which cause a limitation of mobility.

These adhesions could partially be separated, but, as was to be expected, owing to the opposition of the two raw surfaces, a fresh adhesion arose.

At first it appeared to me that these adhesions should be due to periostitis of the orbital wall, but in none of the cases did I find any history of previous bone-disease. Probably such adhesions must be looked upon as congenital, and the result of developmental disturbances in fœtal life.

The existence of these cases did not escape the notice of v. Graefe, but he did not attempt to give any explanation of them. Of the cases which I have seen, I purpose, later on, to give a more detailed account.

In the examination of high degrees of strabismus, therefore, it is advisable, in addition to testing the active functions, to test the passive mobility of the eyeball. This can readily be done by seizing with the forceps one of the tendons close to its insertion.

In all other cases, with the exception of these adhesion ones, the different operative procedures enable us to obtain a cosmetic improvement.

In order to secure also a functional re-establishment of binocular vision, it is often necessary to combine with the operative treatment exercise and education, in order to restore the lessened muscular force of the antagonistic muscle, and, on the other hand, to awaken the desire for fusion of the binocular retinal images.

# THE ABSORPTION OF THE AQUEOUS HUMOUR THROUGH THE ANTERIOR FACE OF THE IRIS.[1]

By PROFESSOR NUEL.

THE general opinion seems to be that there is no direct absorption of the aqueous humour out of the anterior chamber through the iris, and especially through the anterior face of this membrane, except perhaps only to the very limited extent to which absorption takes place by diffusion, or particles being taken up by the protoplasm of the endothelial cells.

Th. Leber, in his repeated experiments (like other authors who followed him and Schwalbe in this direction) saw non-diffusible substances enter the anterior ciliary and conjunctival veins and penetrate into the iris only interstitially. He mentioned also that non-diffusible substances make their way into the venæ vorticosæ; but he seems not to attribute great importance to these facts, and especially to their penetrating into the iris. In his last paper, he insists only on the elimination of the aqueous humour through the ligamentum pectinatum and the canal of Schlemm.

Fuchs, who was the first to describe (in man) interstitial clefts in the iris and their orifices on the anterior face of the membrane, did not succeed in obtaining a satisfactory idea concerning the function of this apparatus. Influenced, I suppose, by the publications of Leber, he is inclined to admit that the interstitial clefts and their gaps in the iris, form

[1] Read at the meeting of the British Medical Association, Edinburgh, 1898.

an apparatus for collecting the lymph of the iris and conducting it out of the iris and into the anterior chamber.

If there are free channels conducting the aqueous humour into the iris, out of the anterior chamber, it may be stated that they can be filled by injection of non-diffusible substances in the eye. I need not insist upon the point that injection of diffusible substances can scarcely prove anything in this question. We understand also that any liquid, injected under pressure into the anterior chamber of man, in the cadaveric eye, cannot fill up the open channels of the iris, if they exist, since the artificial hydrostatic pressure, acting on both sides of the membrane would compress and condense its tissues and would close the hypothetical lymph channels, which therefore cannot be injected in this way.

To succeed in injecting such lymph-channels, we must as far as possible imitate the natural circumstances, and let the normal intra-ocular lymph-current carry into the channels a non-diffusible substance, Indian ink for instance (which I employed in preference to others) and which we can see under the microscope after death. The injection in the vitreous humour is preferable to the injection in the anterior chamber, because thus the anterior chamber is left in more natural condition, and is not wholly inundated by the ink.

Many authors have done it before us, and if they did not succeed in filling the lymph apparatus of the iris, it is because they conducted their experiments on the rabbit, the iris lymph apparatus of which animal is entirely rudimentary. In a transverse section of its iris, I cannot find any sign of interstitial clefts. In a face view of the iris of an Albino rabbit, stained by nitrate of silver, my late assistant, Dr. Cornil and I,

found half a dozen little stomata. We did not again succeed in producing an injection of these stomata or of open channels, notwithstanding that the ink filled the anterior chamber in two or three hours.

In pursuing these researches, my present assistant, Dr. Benoit and I, found that the lymph system in the iris of the cat and the dog is much more highly developed.

In cats the orifices in the peripheral zone of the iris are very numerous (a hundred or so). One can see them with a moderate magnifying glass on an iris stained (after removal of the cornea) by nitrate of silver. In the unstained eye one could not see them in this way; they are readily seen under the microscope. About the centre of the iris they begin to appear, at first small in size, and widely separated. More peripherally they grow larger and denser, and the intervals between them become narrower. At the extreme periphery, the intervening tissue is prolonged into the superficial strands of the ligamentum pectinatum.

Four hours after the injection of a few drops of Indian ink into the corpus vitreum, one can see the ink in the outermost zone of the iris penetrating freely through the stomata, in some places into an open sinus, also situated in the periphery of the iris. This open sinus one cannot, as a general rule, see in transverse sections of the iris of the cat, because in most cases the pupil of this animal is enlarged after death, and thus the tissues, gathered together at the periphery, compress and obliterate the sinus. At the periphery of a non-retracted iris you can easily observe it without previous injection of ink as a more or less open channel. Four hours after injection into the vitreous the lymph sinus can be seen to be full. One can see also that in front of

the lymph sinus the intervals between the gaps are rounded rods.

It happens that the Indian ink may cause an immediately inflammatory reaction of the iris (and of the corpus ciliare). If that be so, one can see a very dense army of migratory cells appear in the outside of the corpus ciliare and on the anterior face of the iris; and in that case not a particle of the ink penetrates into the iris sinus, nor along the outside of the corpus ciliare. In the last mentioned place the ink penetrates generally far along the corpus ciliare. In case of an inflammatory reaction the ink particles stop all on a line in front of the first migratory cells. After a longer time (8-15 hours) the lymph cells take up these particles and carry them away interstitially into the tissues.

In successful cases, six to eight hours after the injection the ink is seen penetrating far off from the lymph sinus into the iris, always without being conveyed by migratory cells, and always in the same directions, but I do not know whether through open or through interstitial channels. In the first place the ink penetrates about the blood vessels, which are very numerous behind the sinus, and the walls of the blood vessels are penetrated by the ink particles. In the second place, the ink penetrates towards the pupil in a continuous track, always situated in front of what is described as the dilatator pupillæ; it goes towards a similar track coming from the pupillary margin where the ink penetrates also through open orifices, but which are smaller in size and less numerous.

Probably the aqueous humour penetrates normally in the lymph sinus, and thence is absorbed again by the blood vessels, but in a manner with which I am not acquainted.

In the dog, we find no very apparent orifices in the anterior face of the iris. Four hours after injection in the vitreous, the Indian ink, filling up again the ligamentum pectinatum, penetrates thence into the iris, in a track similar to that seen in the cat. Another trail of ink comes also as in the cat, from the pupillary zone, where the ink penetrates through more numerous open orifices.

In a transverse section of the iris of the dog, the pupil of which was not enlarged, and the eye not injected, one can see at the periphery a large cleft penetrating from the ciliary side into the iris. This is the canal injected in the previous preparation. It is also possible to make out in the pupillary region an interstitial cleft, opening into the anterior chamber.

These trails of ink penetrating the iris are always in intimate contact with numerous blood vessels; they institute a dense layer of iris vessels, dense especially at the periphery.

It is not my purpose to attack at present the question of the absorption of the aqueous humour through the canal of Schlemm. My purpose has been to prove in this paper only the fact of the absorption of this liquid by the iris, especially in cats and dogs.

Permit me to insist not only on the fact of the free penetration of a non-diffusible substance out of the anterior chamber into the iris, in cats and dogs, but also that this seems to be the first demonstration of free flowing of non-diffusible substances out of the anterior chamber in general. Leber, however, denies this free penetration into the canal of Schlemm, and especially into the iris.

After this, there can be no doubt that in men also, the orifices in the anterior face of the iris and the interstitial clefts into which they lead, have the same function.

The proof of this fact has numerous pathological consequences, all of which it is impossible at present to discuss.

In the first place, it must be established that in respect to the development of this lymph system of the iris, there are great differences in men. You may find eyes in which it is hardly indicated. In others it is greatly developed, as it is in the peripheral zone of the iris of the cat.

Perhaps this difference is not without importance in respect to the predisposition to glaucoma.

In one case of ectopia pupillæ, I found it on the side of the ectopia, developed in such a manner that the anterior lamella of the iris, situated in front of the interstitial clefts, was entirely absent. May this not be the cause of ectopia?

We may suppose that this is the reason of the bad result which iridectomy so often gives in glaucoma chronicum, considering that the excision of the iris diminishes the excretion of the aqueous humour.

My assistant, Dr. Benoit (in a paper published in the *Arch. d'Ophtalm.*), has called attention to the fact that gumma of the iris appears nearly always in the pupillary zone of the iris, and in the extreme periphery.

In the same manner, the first tubercles of the iris appear usually in these two regions. At a later period of tuberculosis of the iris, tubercles appear on the whole surface of the membrane, but this is a secondary sowing, a kind of generalisation in the anterior chamber. We may assume that the pathological seeds, coming chiefly from the corpus ciliare, carried by the aqueous humour, penetrate in the lymphatic orifices.

On taking this point of view, we understand the antiphlogistic effect of mydriasis in iritis, admitting that pathogenic seeds or phlogistic substances pro-

voke the iritis by penetrating in the membrane, this penetration being diminished by the mydriasis, which closes the lymphatic orifices.

Myotics open these orifices, mydriatics close them, hence partly the usefulness of myotics, and the danger of mydriatics in glaucoma.

The *rôle* of this absorbent apparatus is very evident in the resorption of pathological exudates out of the anterior chamber.

Permit me to call attention to another circumstance shown by these experiments. It is generally admitted that the aqueous humour is partly evacuated through the optic nerve, along the central vessels. This evacuation is obvious in rabbits, but not in cats and in dogs, as is shown by my injections of Indian ink into the corpus vitreum. This circumstance may perhaps render us cautious in discussing the pretended glaucoma posterior.

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## TWO RARE SYPHILITIC LESIONS OF THE EYE.[1]

By Henry Juler, F.R.C.S.

Ophthalmic Surgeon to St. Mary's Hospital; Consulting Ophthalmic Surgeon to the London Lock Hospital; and Surgeon to the Royal Westminster Ophthalmic Hospital.

I am bringing before your notice to-day two rare syphilitic affections of the eye; one, *symmetrical gummata of the ciliary body*, the other, *interstitial keratitis in acquired syphilis*.

[1] Read at the meeting of the British Medical Association, Edinburgh, 1898.

(1) *Symmetrical Gummata of the Ciliary Body.*—Few will disagree with me when I state that intra-ocular syphilomata are rare lesions of the eye. When a gumma starts within the eyeball it does so either in the iris, ciliary body, or choroid—in other words, in some part of the uveal tract. It is my opinion that the ciliary body is the most constant site, though here, in this position, not many more than a dozen case, have been placed on record.

For some time past I have been especially on the outlook for these cases, and being connected with the London Lock Hospitals I have had every opportunity of seeing such lesions if any had come under the notice of the surgical staff of those Institutions, yet only one has so far been met with, and for several reasons I consider this worthy of publication.

B. D., aged 25, single, a footman, was admitted into St. Mary's Hospital under my care on November 30, 1897, suffering from severe plastic iritis in both eyes.

About the middle of August he contracted a chancre on the penis, followed a month later by secondary manifestations of syphilis. In October he was admitted to the Male Lock Hospital under Mr. Ernest Lane for rupial sores on his legs and thighs. A week after his admission he developed iritis in his right eye, and a few days later his left iris became inflamed. Mr. Lane treated him with intravenous mecurial injections, and prescribed atropine for his eyes. About the middle of November I was called into consultation and found the patient suffering from a severe attack of "iritis gummosa." There was much effusion of lymph and several orange-coloured deposits present in both irides.

This condition was still present when he was admitted to St. Mary's Hospital. The right pupil was small and irregular, with broad synechiæ, the left somewhat larger

and also irregular. The pupillary area contained lymph. The tension of both eyes was normal. To the outer side of the left cornea and below the level of its horizontal meridian a slight bulging in the ciliary region was present.

This ciliary swelling gradually increased in size, and during the first week of the New Year the left eye was so bad that it seemed hopeless to apply any local remedies. At the site of the tumour the sclera was apparently much thinned and had the blue appearance of a ciliary staphyloma. The outer part of the anterior chamber was shallow, the iris evidently being pushed forwards at this point, but there was no irido-dialysis. Owing to lymph being present in the pupillary area it was impossible to see any growth, the media were so hazy that the fundus reflex was scarcely visible. I felt certain now, although the tension was not raised, that there was a gumma in the ciliary body. A slight ciliary staphyloma now appeared above the right cornea. The vision was equally bad in the two eyes, scarcely amounting to the recognition of fingers. Much pain was experienced in the eyes and the general health suffered severely, the man being wasted and anæmic. He also had at this time, for a period of a week or more, an intermittent temperature, rising over 100° F. every night and dropping to normal every morning.

In the second week of January there developed successively a painless effusion into his left knee-joint, double orchitis and a gumma on the lower end of the shaft of his right fibula. These new manifestations seemed to relieve his eye trouble for, after their onset, the pain in his eyes disappeared and the ciliary staphylomata began to subside. The staphyloma in the right eye, which never reached the dimensions of that in the left, disappeared sooner, and by January 20 only a slight blueness of the sclera remained, but the iris was drawn up to the sclero-corneal junction at this point.

As the ciliary tumour in the left eye slowly underwent resolution the iris became drawn outwards to the ciliary body in the same way as in the right eye, until its pupillary margin was completely dragged out of sight.

In the second week of February the man was discharged from the hospital, but continued to attend as an out-patient. It was not until some time in March that all bulging of the sclera had disappeared.

In May my final examination of his eyes determined the following condition:—

Both eyes quiet, no evidence of any active inflammation.

Right Eye: V. $= \frac{6}{36}$ Snellen, not improved by spherical lenses; with Javal's ophthalmometer, astigmatism 2·5 D.; R. V. cum + 2·5 D. cyl. ax. horiz. $= \frac{6}{24}$.

Extensive posterior synechiæ, but at the upper part the iris is drawn up as if an iridectomy had been performed. The pupillary area is occupied by organised lymph. The fundus oculi is invisible.

Left Eye: V. $< \frac{6}{60}$ Snellen, J. 20 (still under atropine), by Javal astigmatism = 5 D.

$$\text{V. cum } \frac{-\ 1 \text{ D. sph.}}{+\ 5 \text{ D. cyl. ax. } 55^\circ} = \tfrac{6}{9} \text{ Snellen.}$$

$$\text{V. cum } \frac{+\ 3 \text{ D. sph.}}{+\ 5 \text{ D. cyl. ax. } 55^\circ} = \text{Jaeger 1.}$$

An apparent iridectomy down and out. No lymph in the pupillary area. The disc and greater part of the fundus oculi seemed quite healthy, but to the extreme outer periphery is seen, immediately behind the ciliary body, a large white atrophic area bordered with masses of black pigment.

Throughout the attack mercury was given continuously till March, with two exceptions, viz., the last fortnight in December and from January 9 to January 13; each time the mercury was stopped for salivation and stomatitis. During March he failed to attend the hospital till the 29th, when mercury was once more given for three weeks. Iodide of potassium was given from November 30 to the end of February, with increasing doses after January 16. The last fortnight of December it was suspended. Atropine was persevered with without intermission until stopped on May 17.

This concludes the notes of the case, and I have no

doubt in my mind that the two ciliary staphylomata represented gummata of the ciliary body. The presence of a circumscribed bulging in the ciliary region, altered depth in the anterior chamber, the disappearance of the swelling under mercury and iodide of potassium, and the final evidence of scarring, viz., the dragging of the iris by cicatricial contraction to the ciliary body, and the large tract of choroidal atrophy at the extreme periphery, are points strongly in favour of the diagnosis. The fact also that a gumma was present at the same time in the periosteum of the fibula is also most valuable in stamping the lesion in the eye as a tertiary manifestation, even though it appeared only four months after the initial lesion. In this case the phases of syphilis were rapid. It might well be called a case of acute syphilis. Alexander[1] makes mention of a case of gumma of the ciliary body recorded by Seggel which appeared in a young adult only four months after infection.

As to the usual site of the lesion there appears some doubt. The nodules seen on the iris in "iritis gummosa" are not true gummata, otherwise the iris would be considered the common situation. Nor are the disseminated spots in the choroid, as Hutchinson believes, true gummata. Stedman Bull says in "Morrow's System of Genito-urinary Diseases:" "Gummatous deposits are rarely, almost never, met with in the choroid. Occasionally a severe case of gumma of the ciliary body may extend anteriorly into the iris and posteriorly into the choroid, but even here it is only the periphery of the choroid that becomes involved." Rather an opposite view is taken by Knies in his work on "The Eye in General Diseases." It reads as follows:—"Larger gummous neoplasms also grow from the choroid, iris, and ciliary body, although

[1] Alexander, "Syphilis und Auge," 1889.

rarely from the latter (Mauthner, Woinow, Alt)." He goes on to say: "It is usually impossible to secure their resolution without causing destruction of the eye."

The subject of ciliary gummata has recently been brought to notice by Highet[1] and Vernon Cargill,[2] both of whom have discussed briefly the literature; I do not, therefore, intend to make a repetition. According to the group of cases collected, the lesion is a very destructive one, and vision, if any be retained, is very bad indeed. My case, therefore, is unique in this respect, and exemplifies the possibility of almost complete restoration of sight. It is worthy of notice that the vision was very bad till the proper astigmatic correction was given. Now this is a feature of great interest in these cases—I mean the development of corneal astigmatism. The meridian of the cornea in which the staphyloma occurred became less convex, *i.e.*, hypermetropic. I have no actual proof that the man was not astigmatic prior to his attack of syphilis, but he says his sight was good before his illness; in his own words: "I believe my eyes were perfect before November last, for I could always see to read the smallest print, and could see at any distance and had never been troubled with them." Without laying too much stress on his opinion we have sufficient evidence to believe that the ciliary gummata were the cause of the astigmatism. In each eye astigmatism is present, the amount being greater in the eye which had the larger staphyloma. In each eye the hypermetropic meridian coincided with that of the staphyloma. It will be interesting to note after a period of several months, *i.e.*, after all cicatricial contraction has ceased, whether the altered curvature has been restored to its normal state.

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[1] *Brit. Med. Jour.*, 1896, vol. ii., p. 1380.

[2] *Brit. Med. Jour.*, 1897, vol. i., p. 17.

(2) *Interstitial Keratitis with acquired Syphilis.*—The second case I wish to report is one of interstitial keratitis occurring in a subject suffering from acquired syphilis.

A woman, aged 30, came under my care for the first time in November, 1895, suffering from a severe attack of irido-cyclitis in her left eye. She was a well-developed woman, tall, with good complexion and good features. She had been married ten years, but was separated from her husband and was earning her living in service. She says that six weeks after marriage she developed a sore on the genitals. She became pregnant and miscarried; and the second time she became pregnant she gave birth to a still-born child. Subsequently she had two other children who are alive and healthy. She is under the impression that she caught a disease from her husband. There is no definite history of the usual secondary manifestations of syphilis.

The irido-cyclitis yielded to mercury and iodide of potassium.

Eighteen months later she returned with peripheral choroiditis in the same eye with corresponding reduction in her visual field. This yielded to rest and anti-syphilitic treatment, although the visual field is permanently, though slightly, contracted. For the third time she consulted me about her eyes in January this year, this time on account of her right eye, which was painful and her sight misty. There was circumcorneal redness, a diffuse haziness of the cornea, and a deep punctate opacity as well. It was difficult to say whether these opaque dots were in the substance or on the posterior surface of the cornea. She could count fingers at this period, though with difficulty. On March 8 she had a very typical interstitial keratitis. The whole cornea was cloudy, densest below, and the punctate appearance was lost to view. She had much pain, severe photophobia, and lacrymation, and her general health was in a bad state. Her digestive system was out of order, her tongue coated and her breath foul. She was

also very anæmic and despondent. Owing to the state of her digestion and her mental condition it was thought advisable not to administer mercury. She was given iodide of ammonium and decoction of cinchona. Locally, atropine and cocaine were used. She did not improve very rapidly, so mercury was prescribed in the form of inunctions. This seemed to act as a charm, for from its commencement she improved fairly rapidly. About the middle of April vessels were for the first time observed in the substance of the cornea. One or two were seen above and two or three below. They were visible as vessels with the unaided eye, and not like the usual salmon-patch.

Towards the end of May the cornea began to clear, and on June 11 the punctate opacities again became visible and presented the triangular arrangement characteristic of "descemetitis." With the ophthalmoscope the remains of the blood-vessels in the cornea, brush-like in character, were easily seen. There was still slight circumcorneal redness and some corneal opacity. Vision $= \frac{6}{60}$ Snellen.

So much has been said of recent years with regard to the causation of interstitial keratitis that this case will prove of interest, as it is a keratitis and a very typical example of the kind which cannot be attributed to any hereditary syphilitic taint.

It is my belief that this interstitial keratitis was caused by acquired syphilis. I am ready to admit that the evidence of that disease is not conclusive. The history of the case is suggestive of acquired syphilis, that is all. But acquired syphilis is a very common cause of irido-cyclitis, also few if any instances of peripheral choroiditis can be attributed to any other disease. There is, however, a complaint which so far as ocular complications are concerned is not thoroughly understood. I mean *influenza*, and, though I have not mentioned this in the notes, the patient had had influenza two or more times, and severely. Professor Pfluger, of Bern, at the Ophthalmological Congress

in Heidelberg two years ago, gave his opinion that influenza was a cause of interstitial keratitis. He had observed it in no less than thirty cases, and describes three varieties. In this case, therefore, it is difficult to exclude unreservedly this disease. As a direct or primary cause I do not for a moment believe, but indirectly, that is to say secondarily to constitutional syphilis, it is possible—nay, probable—that it acted as a causative factor.

We have the evidence of Trousseau[1] that acquired syphilis is at times attended with interstitial keratitis. He says it is more common in women, occurs as a late secondary sign or during the period of relapses, and invariably attacks only one eye. He also points out that it does not run such a severe course, is not attended with "salmon-patches," and yields very readily to mercury.

Bull classifies affections of the cornea due to acquired syphilis into four groups :—

(1) Diffuse parenchymatous or interstitial keratitis.

(2) True keratitis punctata of Mauthner, which is identical with the keratitis interstitialis punctiformis specifica of Hock.

(3) Keratitis punctata with general cloudiness of the cornea.

(4) Gummatous keratitis.

Of the four, my case would fall in the first group, as it resembles almost exactly the keratitis of congenital syphilis. It was distinctly a tertiary manifestation occurring thirteen years after the date of the supposed infection. It ran a protracted course with severe symptoms, but yielded to mercury and atropine. So far, the second eye has not been attacked with keratitis.

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[1] *Annales d'Oculistique*, 1895.

# RECURRENT SYMPATHETIC INFLAMMATION AFTER ENUCLEATION FOR PANOPHTHALMITIS. BLINDNESS. EXTRACTION OF CATARACT. RECOVERY OF GOOD VISION.

By THOMAS H. BICKERTON, LIVERPOOL.

CASE 1.—M. H., aged 24, a waitress. While in service in Southport the patient ran the point of a pair of rusty scissors into the left eye, causing a perforating wound of the ciliary region (December 15, 1892).

She was admitted to the Liverpool Royal Infirmary three days later (December 18, 1892) with left panophthalmitis. She proved to be a highly neurotic subject, and positively declined operation. The pain and swelling were great, but the patient—from religious scruples and ignorance—still declined operation, and she was discharged on February 15, 1893 (after nearly nine weeks) with the eye shrinking.

She was re-admitted on March 22, 1893, complaining of pain, redness, and watering of the right eye.

She now consented to have the operation performed, and the small shrunken stump of the left eye (about as large as a small marble) was removed the same day, *i.e.*, ninety-seven days after injury. The circumcorneal redness, photophobia and pain rapidly subsided, and she left the hospital on April 7, 1893.

On July 28, 1893, the patient again presented herself because on the preceding day—224 days after the injury and 127 days after enucleation of the left—"the right eye began to inflame and run," and "there was a fog in front of the eye." There was a good deal of pain and photophobia in the right eye, with pain in the region of the fifth nerve. Atropine was

instilled, the symptoms rapidly subsided, and she left the hospital six days later (August 4, 1893).

On January 19, 1894, she was once more admitted to the hospital with an attack of iritis, which she said began two days before, viz., 398 days after the injury and 301 days after the operation. By means of atropine (six grains to the ounce) instilled every two hours, and pushed to its toxic limit, the pupil was widely dilated in forty-eight hours, a circular ring of uveal pigment deposited on the anterior lens capsule marking the complete ring synechia which had formed. The eye rapidly quieted down, and the patient was discharged eight days later (January 27, 1894) with her previous normal vision unimpaired.

On April 10, 1894, she was again admitted with a second attack of iritis, which had begun four days previously. The adhesions were again completely broken down by atropine (8 grains to the ounce) in five days, a second complete uveal pigment ring being left outside the former ring. Vision was reduced to $\frac{6}{9}$. She was discharged on April 27, 1894, atropine drops being supplied for immediate use should inflammation recur.

On June 8, 1894 (third attack), she came into hospital to remain for eighteen days; the vision was now reduced to $\frac{6}{18}$) ; again on July 25, 1894 (fourth attack), she was admitted with further attacks of iritis, which on each occasion yielded to treatment, leaving fresh pigment deposits in concentric rings, the lens being now completely dotted over, and vision reduced to $\frac{6}{36}$.

Although the pupil at the end of this attack was dilated to 7 mm. its pupillary margin was completely bound down to the lens, which now began to be pushed forward, rapid failure of vision ensuing.

When all inflammation had subsided a large upward iridectomy was performed, which however did not

arrest further deterioration of vision, owing to the onset of lenticular opacity, and when she left hospital (October 1, 1894) for a convalescent home she was blind, having simply perception of light.

For the next ten months she was an inmate of various charitable institutions, and when I next saw her (April, 1897) she had had the lens removed, and two subsequent discission operations performed by Mr. George Walker.

There is a good black pupil, with remnants of capsule. R. E.: sph. + 9 D. c. cyl. + 4 D. axis 165° = $\frac{6}{12}$.

This case emphasises the fact that suppurative inflammation of the globe (panophthalmitis) is *not* protective against sympathetic inflammation.

### Sympathetic Ophthalmia three days after Enucleation. Good Result.

Case 2.—Albert M., aged 31, barman. On June 29, 1890, he was admitted into hospital with extensive lacerated wound of the left eye involving cornea and sclerotic, with prolapse of iris; the injury had been caused by the bursting of a soda water bottle. Immediate enucleation was advised, but declined.

The patient remained in hospital, and after five weeks' suffering consented to removal of the wounded globe, which was immediately effected. Three days later the right eye showed undoubted signs of sympathetic inflammation, plastic irido-cyclitis with optic neuritis occurring.

Continuous treatment—free leeching, atropine and administration of mercury, with general measures—resulted ultimately in the retention of vision of $\frac{6}{18}$.

Two years later, when last seen, the eye was quiet, and the man able to perform his duties as a barman. He died two or three years afterwards, having been able to follow his ordinary employment to the last.

# A CASE OF PARALYSIS OF THE ACCOMMODATION OCCURRING AFTER AN ATTACK OF INFLUENZA.[1]

By R. WILLIAMS, LIVERPOOL.

DR. M. S., aged 35, had an attack of influenza about Christmas, 1897. The attack only lasted a few days, but a week later he noticed a difficulty in reading, distant vision being unimpaired. The difficulty increased, and he came to see me on January 18, 1898. I had previously attended him for a mild, but rather prolonged attack of iritis in both eyes, from which, however, he ultimately recovered perfectly. He has also a marked tubercular family history. His health at this time, however, he considered good.

When first seen the only thing I noticed was a slight dilatation of the left pupil, but the patient volunteered the statement that the print looked smaller with the left than with the right eye. He was then able to read Jä. 1, and his distant vision in each eye = $\frac{6}{6}$—$\frac{6}{5}$ without the aid of a glass. The fundus was perfectly normal in each eye. There was no diplopia. A tonic only was ordered. At his next visit, five days later, the pupil was still larger and sluggish. He now required + 1·25 sph. to see $\frac{6}{6}$, and about + 2·5 for reading Jä. 1 at the proper distance.

*February* 2.—Has still greater difficulty, requiring + 3 for reading Jä. 1. Weak eserine was ordered and strychnine internally. At this time I advised a consultation with Dr. Glynn, who, after careful examination, was unable to discover anything wrong with the nervous system generally.

*February* 7.—He required + 4 to read Jä. 1. There was some slight ptosis, but this was evidently due

[1] Read at the meeting of the British Medical Association, Edinburgh, 1898.

to irritation caused by the eserine, as it disappeared entirely on the cessation of the drug.

After this he went away for a week's holiday, and I did not see him again until March 30, when the pupil was still about double the size of the other. Has had no eserine recently. He feels much better for the holiday.

V. = $\frac{6}{5}$ partly c. + ·50 sph. Reads Jä. 1 with + 2 sph. Advised to continue the eserine.

*May* 17.—The pupil now is only slightly larger than the other. He sees $\frac{6}{6}$ without a glass, but still requires + 2 to read Jä. 1.

*June* 20.—The right eye was noticed to be unsatisfactory and to show precisely the same symptoms as the left. V. R. = $\frac{6}{6}$ c. + 75 + — $\frac{6}{9}$ without a glass. Jä. 1 c. + 3.

*June* 24.—Saw Dr. Mackenzie Davidson in London, who advised "an immediate and complete holiday," and recommended iodide of potassium and nux vomica. The patient is now carrying out this advice, and I have not seen him since the end of June.

In my own experience this case is unique, but I find that a few similar cases have been recorded in French and German literature. The two practical points on which I should like to obtain the views and experience of members of the section, are: the prognosis, first, as to the recovery of the lost function, and second, as to the danger of extension of the morbid process to other nerves or centres.

# NOTE ON A CASE OF CYST OF THE HYALOID CANAL.[1]

By J. Tatham Thompson, M.B.

Early in February of this year I was consulted by a lady, aged 42, living in Monmouthshire, who came complaining of defective vision in the left eye, both for near and distant objects, with occasional diplopia and latterly of headache. She stated that the defective vision had remained constant for fifteen or twenty years. V.: R.E. $= \frac{20}{20}$ J. 1; L.E. $= \frac{20}{200}$ J. 16. Fingers at 12 feet with undilated pupil. The external appearances were normal and the pupils equal and active. On examination with the ophthalmoscope a peculiar irregularity was seen to exist in the refractive condition of the central area, very similar in appearance to that met with in cases of "keratoconus." The pupil was dilated with atropine, and on further examination a small transparent cyst was found to exist, lying close behind the lens; I find that in my notes I described it as being "like a drop of oil suspended in water."[2] When the pupil was fully dilated and the eye slightly rotated a sort of tail or prolongation could be made out projecting backwards for a short distance. The cyst was also visible by means of focal oblique illumination, when it assumed a somewhat pearly appearance.

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[1] Read at the meeting of the British Medical Association, Edinburgh, 1898.

[2] The fundus details appeared as if very highly magnified when seen through the cyst. The distinct nature of the cyst and its differentiation from posterior keratoconus were shown by its position in the parallax and by the position of the spot of light when illuminated obliquely, showing a convex surface, not a concave one. The observations were corroborated by my colleague, Dr. D. Rose Paterson.

C. HESS and L. HEINE (Marburg). The Influence of Accommodation on Intra-ocular Pressure. *v. Graefe's Archiv, vol. xlvi., part 2, p. 243.*

The question whether the act of accommodation affects the intra-ocular pressure has been much discussed. Those who have made direct experiments with the manometer have with few exceptions obtained negative results. On the other hand those who hold, in opposition to the theory of Helmholtz, that accommodation involves an increased tension of the zonula, assume that it involves also a rise of pressure in the vitreous chamber. The question is one of some practical importance; for instance, those who hold that accommodative effort raises the pressure within the eye are opposed, with reason, to a full correction of myopia, on the ground that the increase of tension induced thereby will be likely to aggravate the myopia. Again, in glaucoma the influence of accommodative effort on intra-ocular pressure is a question of great importance. Hess has re-investigated the matter with the thoroughness and precision which characterise all his researches.

The results hitherto obtained by experiments upon dogs and cats are to some extent invalidated by the fact that these animals have not been proved to have any considerable range of accommodation; indeed the drugs which produce accommodative spasm in the human eye have not been found capable of inducing a myopic refraction in the eyes of dogs and cats. To this point, therefore, Hess and Heine directed their attention in the first instance. Sending a faradic current through the eye, and at the same time observing it by the shadow test, they found that while the pupil reacted promptly and the ciliary muscle was thrown into contraction, as proved by the insertion of needles after the manner of Hensen and Voelckers, the accommodative change did not exceed 2 or at the most 3 D. This small range of accommodation was found in cats, dogs, and a young wolf. These animals therefore were rejected as unsuitable for determining the point in question in relation to man. In apes, on the contrary, they found an accommodative reaction to eserine and to faradism of 10 or 12 D. Having thus found a suitable animal, they

proceeded to investigate the question of pressure change. The animal having been anæsthetised, the external eye muscles were divided so as to exclude pressure changes due to their contraction. The chambers were connected with a manometer the sensitiveness of which to very slight changes was proved by the occurrence throughout the experiment of oscillations of the mercury corresponding with pulsation in the eye. The electrodes were applied to the corneo-scleral region. One observer noted the changes in the anterior lens reflex, a second observed the alterations of refraction by means of the shadow test, and a third watched the manometer. The result was that during accommodative changes of large amount the intra-ocular pressure remained unaltered.

Further experiments of the same kind were made with pigeons, and in one instance with a buzzard. Here again they were able to observe a diminution in the size of the lens reflex, a large increase in the refraction of the eye, and an unaltered intra-ocular pressure.

Lastly, the following observation was made upon the healthy human eye. The pupil having been dilated by homatropine so as to facilitate the observation of the retinal vessels, eserine was applied. In this way it is possible to so stimulate the ciliary muscle that it contracts to its maximum under an impulse which does not contract the pupil, and which is associated with little increase of convergence; the action of the external muscles is thereby almost excluded. Under these circumstances the fulness of the retinal vessels and the colour of the fundus showed no discoverable change during strong contraction of the ciliary muscle, and a vein which displayed slight pulsation during relaxed accommodation, and which pulsated more strongly when light finger pressure was applied to the globe, showed no change during maximum accommodative effort.

These results appear to show beyond question that, at least under ordinary circumstances, the pressure in the chambers of the eye is not increased by contraction of the ciliary muscle or pupil.

P. S.

# DO MAMMALS ACCOMMODATE?

By James W. Barrett, M.D., F.R.C.S.Eng.

Surgeon to the Victoria Eye and Ear Hospital; Lecturer on the Physiology of the Special Senses in the University of Melbourne.

It seems to be commonly accepted as a fact that mammals possess the power of accommodation, and in various works more or less positive statements are made to the effect that in the eyes of such animals as cats, dogs and rabbits, an accommodation apparatus exists which is capable of being used effectively. For example, in the "Dictionary of Physiology" published by Richet,[17] (1895) under the heading "Accommodation" we are told that the agents and mechanism of accommodation scarcely differ from those in man and, what is more important, that a great number of the facts respecting accommodation have been gained from experiments on animals. The experiments of Hensen and Voelckers[2 and 4] on the cat, the dog and the monkey are referred to, and those of Hock[5] on the dog. It is noted however, here as elsewhere, that the ciliary muscle of the monkey and of the man is much more developed than those of the remaining animals. In Helmholtz's "Physiologische Optik" (1886, p. 139), the experiments of Hensen and Voelckers on the dog are again referred to as proof of the mechanism of accommodation. In Landolt's "Refraction and Anomalies of the Eye" (translated by Culver, 1886), the same experiments are referred to for the same



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purpose, and in such a recent work as the "Optique Physiologique" of Tscherning (1898, p. 168), it appears that the lens of an ox was used for experiments connected with accommodation, and the ciliary muscle of a cat is delineated (p. 157).

A brief summary of the evidence that has led to this conclusion is, I think, necessary.

Hensen and Voelckers published two articles[2 and 4] embodying their work. Shortly stated, their experiments consisted in inserting needles through the sclera and choroid near to the posterior part of the eye, in the equatorial region, and in the ciliary region, and then stimulating the ciliary ganglion. They employed the eyes of dogs, monkeys, cats, and also enucleated human eyes, the stimulation in the enucleated eyes being effected by electrodes passed into the posterior part of the eye round the optic nerve. They obtained practically the same result in all these cases. The needle in the posterior part of the eye failed to move; that in the ciliary muscle failed to move or moved slightly; whilst the projecting ends of those in the equatorial region were displaced backwards. From this they—and the authors who have followed them—have inferred that the choroid is drawn forward by the contraction of the ciliary muscle. In a further experiment the cornea was cut off, leaving only a narrow margin. Retraction of the edge was then produced by stimulating as before, and some increased curvature of the lens took place. They mention the negative results obtained by Trautvetter[1] with the Sanson images. Such observations are difficult because of the narrow pupil, and as they had trouble with the iridectomies they abandoned the method. Commenting on their work, Hock (p. 771) states that they failed to notice any decided change during stimulation.

Hock[5] repeated their experiments with modifications, stimulating, however, the sympathetic nerve and the

motor oculi at the same time, to produce a middle size pupil. He obtained the same results, but in addition states that he saw, when stimulating both nerves, the images reflected from the anterior surface of the lens move backward and diminish in size.

Langley and Anderson,[15] in a chloroformed cat under the influence of nicotin, passed a needle through one edge of the cornea until the point rested on the anterior surface of the lens. The short ciliary nerves were then stimulated, and there was a movement of the needle showing protrusion of the lens and contraction of the ciliary muscle. They did not, it seems, use iridectomised eyes. Later[16] they tested ciliary muscle action in dogs and cats in three ways. (*a*) A slip of the sclerotic was cut away just behind the ciliary attachment and the choroid directly observed. (*b*) A needle was passed through the edge of the cornea, so that its point rested upon the surface of the lens, and the head and the point of the needle observed. (*c*) The lenses of a phakoscope were fixed on a board and arranged so as to throw two images on the surface of the lens. By the last method they made also one or two observations on the rabbit. Contraction of the ciliary muscle was caused by morphia, or by pilocarpine, or by stimulating the third cranial nerve in the skull. As a control they commonly stimulated the third cranial nerve in the skull. In these cases the needle method readily showed forward movement of the lens. The phakoscopic images in the dog and cat, when viewed very obliquely, are easily seen to advance towards the cornea, and the images when viewed less obliquely become closed together and somewhat smaller. The approximation of the images is however very much less than that which occurs in man, in accommodating for near objects.

Jessop[12] after a large iridectomy used pilocarpine, and then on stimulating the long ciliary nerves saw relaxa-

tion of the ciliary muscle as evidenced by the changes in Sanson's images, which retired from one another. He inferred that the fifth nerve conveyed impulses relaxing the ciliary muscle, and that pilocarpine caused contraction. The changes in the lens of iridectomised eyes can be seen after stimulation of the short ciliary nerves.

There have been numerous descriptions of the ciliary muscle in animals, and Wuerdinger[10] published a table showing the length and maximum breadth of the ciliary muscle in a large number of animals. The breadth of this muscle is greatest in the monkey (·7 – 1·3 mm.). In the llama (·64 – 1·1 mm.), lynx (·65 mm.), fox (·7 mm.), and fish otter (·7 mm.), it is tolerably broad and in the rest narrow, though some of the eyes were large, those of the horse, deer and llama being especially so.

It is further significant that in the first edition of the handbook of Graefe and Saemisch, it is remarked that investigation is rendered more difficult by the fact that the ciliary muscle in all animals except man is traversed and covered with numerous pigment cells.

Such, in outline, so far as I can ascertain, is the positive evidence which has been furnished for the existence of accommodation in mammals, and against it is the apparently overlooked observation of Trautvetter,[1] who published an account of what appears to have been a most thorough investigation into the nerve supply to the ciliary muscle. He fixed animals so that he had under observation the images reflected from the anterior surface of the lens, and he then stimulated the third nerve, the sympathetic nerve and the fifth nerve respectively, chloroforming or killing the animals before stimulation. He further watched the images while he suspended in the sight of starved animals articles of food which he moved to different distances. He further stimulated the ciliary muscle

through the sclera. Never, however, in the course of an extensive research (repeated afterwards with modifications in Heidelberg under Helmholtz's supervision) did he succeed in causing any change in the images. In birds, however, he succeeded on noting and measuring the change both as a result of voluntary action and of stimulation. His attitude is striking—he just suggested that animals did not accommodate, but evidently believed that he had failed in discovering the nerve mechanism.

Some thirteen years ago Mr. Lang[8] and I investigated the refractive character of the eyes of mammalia, using as a means of estimating the refraction the then newly discovered method of retinoscopy. We examined in all 185 eyes of domestic and of wild animals. We found that in the references to this subject, and in ophthalmic literature generally, it was generally assumed that these animals accommodate. Hirschberg stated that the hypermetropia, which was most frequently met with, might be explained on teleological grounds, since accommodation was possible. We then asked the question what positive and direct evidence there was in favour of such a statement, as we knew of none.

In the course of that investigation we had occasion to examine the eyes of some particular animals several times, and sometimes to examine the eye of a rabbit for an hour at a time by retinoscopy and with the ophthalmoscope. Never, however, from the beginning to the end of the investigation did we notice any change of refraction, as we must have done had the animals accommodated. In monkeys, however, of whom we examined eleven, change of refraction was frequently noticeable. Furthermore, we thoroughly atropinised the eyes of a cat and allowed it to pursue a mouse when both eyes were thoroughly under the influence of the belladonna, as determined by the con-

dition of the pupil. The animal pursued and caught the mouse without any difficulty.

On my return to Australia I[13] adopted the suggestion of Mr. Lang, and worked at the subject by another method. I performed a double and opposite iridectomy in two consecutive operations on the eyes of two dogs and one cat and a rabbit. I then thoroughly atropinised the eyes of these animals and worked out the refraction by retinoscopy. Then I waited until the effect of the atropine must have passed away, instilled eserine in maximum doses, and re-examined the refraction by the same method. Control experiments were made on the uninjured eyes of animals to test the value of the atropine and eserine on the iris. Mr. Lang and I had hitherto found that in non-presbyopic human eyes eserine caused an approximation of the far point which reached the maximum twenty minutes after its application.

If, then, we call the far point F, the position assumed under eserine F′, and the normal range of accommodation R, we can find the value of this fraction $\frac{F - F'}{R}$ in human eyes. It is in the case of young adults, ·65; in the case of older people, ·84. If, then, I found on examination of the iridectomised eyes of these animals any value for this fraction, I was justified in assuming that they could accommodate. The table published, however, showed that there was no appreciable change after the use of atropine and eserine. I therefore concluded that they did not accommodate.

More recently, however, the subject has been reopened and the following experiments have been performed on the eyes of two small monkeys which did not appear to be senile. In one animal both eyes were operated on, in the other only one, the fourth being left uninjured to test the action of myotics or

mydriatics. The irides of these animals were extracted in one operation since they gave way at the base. After the blood had been absorbed from the anterior chamber and the irritation of the eye had subsided, a series of examinations were made.

The method of examination adopted was as follows:—The monkey was held by the back of the neck and retinoscopy performed at a distance of about one metre. Glasses were held in front of the eye by an assistant and the refraction measured in that way. Various attempts were then made to induce the monkey to look at objects close to him, and when he accommodated other lenses were placed before his eye and the altered refraction measured. The work was tedious to a degree, since he rarely, if ever, looked fixedly at any object for more than a few seconds at a time. By constant repetition, however, tolerably uniform results were obtained.

## MONKEY NO. 1.

*Iris removed in both eyes.*

(1) *December* 27, 1897.—Refraction estimated by retinoscopy (without deduction) and without apparent accommodation. R.: + 1 D., vertical meridian; + 1·5 D., horizontal meridian. L.: 1 D., vertical meridian; + 1·5 D., horizontal meridian.

(2) On repetition (March 11, 1898). R.: + 1·5 D. approx. in both meridians. L.: + 1·5 D. approx. in both meridians.

(3) *December* 4, 1897.—Atropine sulphate drops applied (gr. iv. to ℥i.) several times in twenty-four hours. R.: + 2·5 D. approx. in both meridians. L.: + 2.5 D. approx. in both meridians. On looking at near objects no apparent change.

(4) *March* 12, 1898.—Atropine sulphate drops (gr. iv. to ℥i.) applied several times in preceding twenty-four

hours. R.: + 1·5 D. to + 2 D. approx. in both meridians. L.: + 1·5 D. to + 2 D. approx. in both meridians. No apparent change when looking at near objects.

(5) *December* 23, 1897.—Prior to any application, refraction whilst looking at near objects. R.: — 2·5 D. to — 3 D. approx. in both meridians. L.: — 2·5 D. to — 3 D. approx. in both meridians. Eserine sulphate solution (gr. ij. to ℥j.) was then dropped into the eyes and the accommodation again tested in twenty minutes; it was then—R.: — 3 D. to — 4 D. approx. in both meridians. L.: — 3 D. to — 4 D. approx. in both meridians. Forty minutes after instillation the refraction without accommodation was—R.: + 1 D., vertical meridian; + 1·5 D., horizontal meridian. L.: + 1·5 D., vertical meridian; + 1·5 D. or 2 D., horizontal meridian.

(6) Eserine solution applied as before. Refraction fifteen minutes, and forty-five minutes afterwards. L.: + 1 D. to + 2 D. On looking at near objects, — 4 D. to — 5 D.

(7) *December* 29, 1897.—Eserine solution applied as before. Thirty-five minutes later refraction was, R.: + 1 D., vertical meridian; + 1·5 D. or 2 D., horizontal meridian. L.: + 1 D., vertical meridian; + 1·5 D., horizontal meridian.

(8) *March* 20, 1898 (eight days after atropine application).—Eserine solution applied as before. Sixty minutes afterwards refraction was, R.: + 1 D. approx. in both meridians. L.: + 1 D. approx. in both meridians. On looking at near objects—R.: — 1·5 D. to — 2 D. approx. in both meridians. L.: — 1·5 D. to — 2 D. approx. in both meridians.

### Monkey No. 2.

Left eye only operated on. The iris of the right eye responded to eserine and atropine in similar

manner to the iris of the human eye, no exact measurements being made. The right eye was used as a control when atropine or eserine were applied to the other three eyes, *i.e.*, the right and left of Monkey No. 1, and the left eye of Monkey No. 2.

(1) *December* 27, 1897.—Refraction of the left eye: + 1·5 D., vertical meridian; + 2 D., horizontal meridian. On looking at near objects, − 3 D. to − 4 D.

(2) *December* 30, 1897.—Atropine sulphate solution (gr. iv. to ℥i.) applied several times in the preceding twenty-four hours. Refraction: + 1 D. approx. in both meridians. No apparent alteration on looking at near objects.

(3) Eserine sulphate solution (gr. ii. to ℥i.) applied. Refraction, forty to sixty minutes afterwards, + 1·5 D., approx. in both meridians. On looking at near objects, − 3 D., approx. in both meridians.

(4) *December* 29, 1897.—Eserine sulphate solution applied. Refraction thirty-five to fifty minutes afterwards: + 1 D., vertical meridian; + 1·5 D., horizontal meridian.

These results show that the animals had a voluntary range of accommodation of about 4 D. to 5 D. They further showed that the refraction $\frac{F\ F'}{R}$ has in the monkey no appreciable and constant value, and that since this animal undoubtedly accommodates, the conclusion formerly drawn with respect to the cat, dog and rabbit might be erroneous. They show also that atropine and eserine appear to act on the iris and ciliary muscle of the monkey much as in man.

We next tested the matter in another way. The monkeys were chloroformed and a pair of electrodes were applied to the sclera 3 or 4 mm. from the sclero-corneal margin at opposite points, and through these a Faradic current of varying strength was passed.

The refraction of the eye was examined from time to time by retinoscopy and duly noted.

The eyelids were held open sometimes with a specially contrived speculum, sometimes with the fingers, sometimes by means of threads passed through the lids and held by assistants. The electrodes used were sometimes stout Bowman's probes and sometimes fine needles. (It will be remembered that this indirect stimulation gave positive results with Trautvetter in the case of birds, and negative results in the case of dogs, cats and rabbits.) The stimulation is very apt to throw into action the muscles of the lids, and the experiments were frequently repeated with varying strength of current to eliminate any possibility of change of refraction being produced by the pressure of the electrodes resulting from lid contraction. The difficulties are not inconsiderable, since the cornea of the monkey soon suffers from exposure and retinoscopy becomes uncertain. With frequent repetition, however, the results were uniform.

### Monkey No. 1.

*March* 16, 1898.—Chloroform administered. Lids held open with sutures. Apparent refraction of left eye: just —, vertical meridian; +, horizontal meridian. On stimulating through electrodes placed on sclerotic 3 to 5 mm. from cornea and in horizontal meridian, the refraction of that meridian became — 3 D. and the vertical meridian remained +. On stimulation in the vertical meridian the refraction in that meridian became — 3 D. and the horizontal remained unaltered.

*March* 30, 1898.—Similar experiment. Stimulation only in horizontal meridian. Refraction, when electrodes applied prior to turning on current, was +; on turning on current the refraction became — 2·5 D.

*July* 7, 1898.—Repeated trials of same experiments with control experiments to eliminate effect of pressure. Both meridians became affected if stimulation excessive.

(1) From these experiments it follows that by the indirect electrical stimulation of the ciliary muscle meridional accommodation may be produced, and this in the monkey gives a range of accommodation of about 3 D., which is rather less than that which the monkey is able to exercise voluntarily.

(2) As a rule the refraction in the meridian at right angles to that stimulated remains unaltered, or is but slightly increased, unless the stimulation be excessive.

Having established, then, the fact that in the case of the monkeys electrical stimulation gave much the same result as the voluntary use of the apparatus, a number of double opposite iridectomies (mostly in sequence) were performed on cats and dogs. After the absorption of the blood and the recovery of the eye, the same procedure was adopted as in the case of the monkey, the ciliary muscle being stimulated and the monkey used as a control. The eyes of one dog and two cats were thus examined with the assistance of Dr. Orr, whose kindly aid enabled me to complete the investigation.

*Dog*, on the eyes of which a double iridectomy had been previously performed:—Refraction under chloroform before stimulation: + 1 D. approx. in both meridians. After stimulation no apparent change.

*Large grey cat*, on whose eyes double successive iridectomies had been previously performed:—Refraction under chloroform prior to stimulation: L.: + 2·5 D., vertical meridian; + 2 D., horizontal meridian. No apparent change on stimulation. Experiment repeated with right eye. Refraction under chloroform prior to stimulation: + 3 D., vertical

meridian; + 2·5 D., horizontal meridian. No apparent change on stimulation.

*Brown cat*, on whose eyes double successive iridectomies had been previously performed:—No apparent change under stimulation. In no instance was any alteration or refraction to be detected.

Marshalling our facts, therefore, it seems that the belief that mammals accommodate has largely rested on the knowledge that man and monkeys do accommodate, and on the supposed presence of a *developed* ciliary muscle in mammals other than monkeys and man.

Beyond this the experiments of Hensen and Voelckers seem to have been regarded as conclusive. They only prove that some movement took place within the eye on stimulation, but in the light of subsequent information the possibly misleading character of the inferences drawn is obvious. That the movements should have taken place in much the same manner in the eyes of man, monkeys, cats, and dogs should have made observers cautious in drawing inferences, since it was even then known that the ciliary muscle was much more developed in man and monkeys than in other mammals.

The experiments of Hock on Sanson's images are not fully detailed. In any event, the production of a pupil large enough to permit the observation must be a very difficult matter when it is to be accomplished by simultaneous stimulation of the sympathetic nerve and motor oculi. Against his observation and those of Langley, and Anderson, and Jessop, we have to place the prolonged observations of Trautvetter made on iridectomised and doubly iridectomised eyes.

The results of the observation of Mr. Lang and myself, and subsequently of Dr. Orr and myself, may be summarised as follows:—

(1) No alteration of refraction has been detected by

us during examination by retinoscopy, or with ophthalmoscope, in any mammal except man and monkeys.

(2) The animals examined have been rabbits, guinea pigs, rats, mice, cows, horses, dogs, among domestic animals; and deer, jackal, pecari, various cats, hyena, opossum, porcupine, mongoose, and thirteen monkeys amongst wild animals.

(3) A cat fully under the influence of atropine could capture a mouse with ease.

(4) Examinations by retinoscopy, under atropine and under eserine, of doubly iridectomised eyes, showed no material difference in dogs, cats and rabbits. As however, no constant and material difference was indicated with monkeys the positive value of this observation is inconsiderable.

(5) Monkeys can accommodate voluntarily, and the range can be measured, in our own case being 4 D. to 5 D.

(6) Under electrical stimulation meridional and total accommodation could be induced, and the usual range was somewhat less than the voluntary range.

(7) Similar electrical stimulation of the eyes of cats and dogs produced no appreciable result.

(8) It is tolerably certain that cats and dogs do not accommodate to any appreciable extent.

(9) It is probable that the accommodation apparatus is rudimentary or absent in mammals with the exception of man and monkeys.

(10) The accommodation apparatus of man is superior in efficiency to that of the monkey.

If these conclusions are accepted it will at once be seen that they may seriously affect the various theories of the mechanism of accommodation, since, as already indicated, so recent a writer as Tscherning has been drawing conclusions from experiments on the lens of an ox. All such experimental evidence will need review, and for the future experiments performed on

the eyes of only man and monkeys will be acceptable as a basis of proof. Had the method of retinoscopy been known when Hensen and Voelckers or Trautvetter made their investigations the matter would have been speedily settled.

Dr. C. J. Martin, acting Professor of Physiology in the University of Melbourne, has given me much assistance during our work, and Dr. J. N. Langley, of Cambridge, was good enough to assist me in the matter of references.

## Postscript.

I had not intended to comment at length on previous observations, because hitherto it would appear no one has attempted to estimate the refraction during accommodation in these animals. This appears to be the only certain method of deciding whether they do accommodate or not. As already stated, if retinoscopy had been known in the time of Hensen and Voelckers their indirect methods—the only proceeding available—would have been abandoned in favour of the ophthalmoscope. As my results are apparently irreconcilable with some of those preceding I append a few suggestions.

The anterior surface of the human lens moves forward during strong accommodation only 0·4 mm., whilst the posterior surface remains stationary (Landolt). In the needle experiment of Langley and Anderson the needle would be about 6 mm. in the anterior chamber, gripped by the cornea, and with the point resting on the lens. If 0·4 mm. is the extreme possible movement in the human eye, what movement would be observable in their experiment on an animal in which the changes were "very much less" than in the human eye in accommodation? Is it not likely that there is some other cause for the movement than accommodative change?

Hensen and Voelckers removed cornea and lens, and then stimulating, saw the vitreous push through the opening and become more convex. This they referred to contraction of the ciliary muscle raising the vitreous pressure. As we know that in the human eye the lens does not move forward, what does the above experiment prove ?

The observations on the Sanson images are much the most important and by far the most contradictory.

(1) Trautvetter examining iridectomised and double iridectomised eyes could not detect any alteration on stimulation.

(2) Hensen and Voelckers examining non-iridectomised eyes failed to detect the change.

(3) Hock examining non-iridectomised eyes observed the change on stimulation.

(4) Langley and Anderson examining non-iridectomised eyes saw movement on stimulating the third nerve of a cat, but it was very much less than in the human eye in accommodation.

(5) Langley and Anderson stimulated the sympathetic, and saw no change, but in two (exceptional) instances in the dog saw the lens move forward.

(6) Morat and Doyon[14] stimulated the sympathetic and saw the images enlarge ; a needle touching the front of the lens moved backward.

(7) Jessop stimulated the sympathetic and saw no change, but in animals in which he had used pilocarpin in stimulating the long ciliary nerve the images retired from one another. He examined iridectomised eyes.

Now when good observers differ in this remarkable manner there is reason to suspect that the method is faulty or that some correlating factor has escaped observation. I find myself quite unable to reconcile the results with one another, or some of them with my own. The observations of Trautvetter agree with my

own. To settle the matter it is desirable that in the doubly iridectomised eyes of an animal the third nerve should be stimulated whilst the Sanson images are observed. If the characteristic changes are seen the refraction of the eye should be estimated by retinoscopy before and after stimulation. By that means the relationship of slight or great alteration of one refractive surface to the total refraction of the eye can be readily ascertained.

It is quite possible that slight alteration of the images may be attended with no appreciable alteration in the total refraction.

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After the completion of this paper I was placed in communication with Dr. Th. Beer through the kindness of Professor Fuchs, of Vienna. In Dr. Beer's well-known work on "The Accommodation of Reptiles," he found a range amounting in some instances from 13 D. to 15 D. He kindly permits me to refer to unpublished experiments on dogs, monkeys, cats and a fox. He found that all these animals accommodated even in the enucleated eye. The anterior surface of the lens became more convex when the sclero-corneal puncture was stimulated. But the dioptric value of the changes is very different. In Macacus rhesus, he found a range of 10 D. In the other animals about 1 D. to 3 D. It is difficult to make sure of a change of less than 2 D. But for many animals this will be quite enough, as they do not want to look sharply at objects nearer than 15 to 1 M.

By way of comment on his observations, it may be remarked that monkeys and man have a large range of accommodation, and so have reptiles; some mammals have either none or very little. The observations of Lang and myself show that some mammals have so much hyperopia that a small range would be useless; and until further evidence is adduced, may we not regard the ciliary muscle of some mammals, like the retrahens aurem in man, as an anatomical and physiological relic.

My best thanks are due to Dr. Beer for his kindness.

THEODOR BEER. Accommodation in the Animal Kingdom. *Wiener Klinische Wochenschrift, October* 20, 1898.

In June, 1895, there appeared in the OPHTHALMIC REVIEW a highly appreciative notice of the work done by this talented naturalist in the direction of determining the accommodative methods of various fishes. He has extended his view now to include the animal kingdom generally, at least as regards the simple eye, *i.e.*, not the compound eye of the insects. No one can read his able and interesting paper, presented at the Meeting of the International Physiological Congress held in Cambridge, without being impressed by the untiring industry and skill displayed in a research which must have required a long period of painstaking study. The record of Beer's work is too interesting to be passed over with a mere dry statement of his results, but we give a reduced translation of his paper, which is remarkable for this quality besides others, that it forms most agreeable reading. Much of the work was done in the Great Marine Zoological Station in Naples, a place which, founded and still directed by Anton Dohrn, is resorted to by students of nature from all corners of the world, and where many investigations, important alike from fishery and from zoological points of view, have been and are being carried out now.

So far as we know, accommodation is non-existent in insects and crustaceans, and the great thickness of the retina in these animals relatively to the small dimensions of the closely placed component eyes renders it probable that accommodation is entirely unnecessary. But putting aside the compound eye meantime and turning our attention to the higher animals, we observe that while the human eye is adapted without accommodation for objects at 6 metres distance, an eye of much larger dimensions must accommodate in order to gain clear pictures from such a distance. The horse, the whale, giraffe, ostrich, have eyes as large as apples, many fishes have eyes as

large as an orange, some cephalopods have eyes as large as a child's head or even larger. Again, some birds have eyes approximately equal in size to the human eye, but much sharper sight in virtue of the greater fineness and delicacy of the retinal mosaic; and, on the other hand, there are animals which are less sharpsighted and have small eyes with minute retinal images and a relatively coarse retinal mosaic, for example, the bat; in these, while accommodation for greater distances than 6 metres or more must be lacking, yet the small pupil assists accuracy of vision by cutting off the circles of diffusion. It is noteworthy, too, that most small animals require to have accurate images of very small objects at very minute distances. Thus the small-headed birds may be supposed to require a greater range of accommodation than the larger mammals do, since among the latter it is only man and the monkeys who bring objects at all near to the eyes; for the most of them, say for example the ruminants, a range of about 2 D. should suffice, since objects are rarely nearer than half a metre from the eye.

Of the three methods by which the refractive power of a camera may be increased, viz., augmentation of the refractive index of the media, increased curvature of the refractive media, or increased separation of medium and screen, the first mode of "accommodation" is not known to exist in the eye of any animal. The last-mentioned method was for a time regarded with favour by naturalists and was supposed to be brought about by the action of the straight muscles, the oblique muscles, the lids, and the ciliary processes respectively, before the facts as we know them now had come to light. But we are now in a position to say that in the mammalia, the birds, the lizards, and turtles, as well as in man, accommodation is brought about by increase in the curvature of the crystalline lens. But a quite different principle, viz., the alteration of the distance between lens and retina, is to be found in certain divisions of the animal kingdom, the cephalopods, the fishes, the amphibians and the ophidians. The cuttle fishes form the only group in the invertebrate kingdom

in which accommodation has been shown to exist. Examination of a great number of molluscs at the Zoological Institute at Naples, both by direct examination and by retinoscopy, has convinced Beer that the eyes are when at rest adapted for near objects only; there exists a degree of myopia between two and ten dioptrics. But it does not follow from this that no "accommodation" exists, as has been maintained by Cramer for example, who says that it is impossible that a lens so globular as that of the cuttlefish can afford any increase of refraction. Beer is satisfied that the animal can voluntarily *diminish* the distance between lens and retina and so negatively accommodate for distant objects. This is accomplished by the contraction of a muscle which passes from the equator of the eye to the periphery of the lens and draws back the anterior segment of the eye. The range of accommodation is probably small in the decapods, which have but a very low degree of myopia, but in the highly myopic octopods the range is greater, for it can be carried to adaptation for parallel rays.

The eye of the fish resembles that of the cephalopod only in external appearance and in the highly globular shape of the lens, but in fishes also negative accommodation for distance is possible. This is the more remarkable since the mechanism by which it is brought about is entirely different. The ciliary muscle, ciliary body, zonule and Fontana's space, are absent here also; and the iris, which does not lie upon the lens but is quite free from it, cannot have any effect in cutting off its peripheral portions. At the upper region of the spherical lens is the suspensory ligament; at the lower portion is a structure regarding the nature and function of which there have been differences of opinion among naturalists. This tendon-like piece of tissue, which has been called from its somewhat bell-like shape the campanula, draws the lens backwards and adapts the eye, which is myopic when at rest, for rays coming from more distant objects. The iris can have no influence on accommodation. Though this retractor lentis is of unstriped muscle, it is in the

more swiftly swimming fishes capable of rapid contraction; in the more sluggish members of the group it acts much more slowly, in some taking actually several seconds to respond to electricity; in all fishes, however, it responds more quickly than the iris. It is curious to note that, whereas in cephalopods atropin has no influence on "accommodation," a fish poisoned with a very small dose of atropin either dropped into the tank, or, injected subcutaneously, ceases altogether to have any power of negative accommodation, as can be proved by ophthalmoscopic examination of the living or electrical testing of the freshly enucleated eye. The greater the amount of myopia in the animal, and it varies from 2 to 12 D. at rest, the greater is the range of accommodation. The less degrees are to be found in the swiftly swimming pelagic fishes, the higher degrees among the slower swimmers and those which burrow; in all, or almost all, parallel rays can be focussed when the maximum accommodation is exerted. It must strike one as remarkable that in these two classes of water dwellers, the cephalopods and fishes, and in no air-breathing animals, accommodation is of this negative type, and there can be little doubt that the greater resisting power of water as compared with air, and its—in general terms—smaller extent, perhaps, are the facts which render it necessary that an animal should be, when at rest, adapted for near vision, and able to see at a distance only after muscular effort. The idea that the flattened condition of the central portion of the cornea of the fish is a mechanism to adapt it to see in the air as well as in water, an opinion formerly much credited, must be given up, for if the eye of a fish is examined without being removed from water the cornea will be found to be not at all flattened. It is a curious and noteworthy circumstance that even deep-sea fishes and cephalopods, such as certain which have been raised from 1,000 metres, possess a well developed accommodation apparatus, a fact which seems to show that not only light and shadow, but form also can be appreciated even at such a depth.

In the amphibians, so far as they possess any such

power, accommodation is positive for near objects, but in them this is not accomplished, as in the most of the reptilia and in all higher forms, by an increase in the curvature of the lens, but by an active augmentation of the distance separating retina and lens. The lens itself, though not globular, as has been asserted by some, is of high curvature and does not change its shape on being separated from its surroundings. The feebly developed ciliary muscle by its contraction increases the pressure in the vitreous chamber, which causes the movable lens to be pushed forwards towards the cornea; the displaced aqueous humour is accommodated in the angle of the anterior chamber, which is made wider by the same action of the muscle. The ciliary muscle is unstriped and its action is therefore slow, and the range is but small, amounting to less than 5 D. in the toads (Bufonidæ) and salamanders; the newts possess the largest range. In all the true frogs (Ranidæ) examined, even in the large-eyed bull-frog, accommodation was found to be absent. As in the fishes so in the amphibians, the idea of an eye adapted for vision in two elements must be given up. The cornea of the amphibians is not flattened but highly curved, and under water by the loss of the corneal refraction (for its index is almost exactly that of water) the animal must have a hypermetropia of nearly 25 D.—a degree which its range of accommodation is powerless to affect. When one reflects upon the fact of the extremely bad vision which the animal must therefore have under water, especially in the turbid water in which it lives, it seems probable that the water is not its hunting ground so much as a place of security, from which it projects the head in order to see more clearly.

Positive accommodation by increased separation of the unchanged lens and retina was found also in the reptilia, but not higher; in them the range of accommodation is large, amounting to more than 15 D. in certain adders. The general condition is that of a low degree of hypermetropia, as may be shown by direct estimation and by retinoscopy. In the majority of the reptilia there is no

ciliary muscle; but a circular striped muscle, lying partly inclosed within and partly upon the root of the iris, seems to exert a similar function to the structure above described as existing in the amphibians, only much more powerfully and to a greater degree. This structure seems to be peculiar to the reptilia. When a near object is suddenly presented to the animal this powerful circular muscle quickly contracts, raises the pressure in the vitreous chamber, pushes forward the lens and provides for adaptation for near objects exactly as a photographer does with his camera. The aqueous humour displaced from the centre finds space in the periphery of the anterior chamber: the curvature of the lens remains entirely unaltered. Since the mechanism obviously requires the integrity of the vitreous chamber, it can be easily demonstrated, as Beer has indeed done, that a puncture through the sclerotic, if kept patent, entirely prevents the "patient" from accommodating. In only one snake, the Tropidonotus tessellatus, which is amphibious in its habits, the two methods of accommodation, viz., projection of lens with increase of its curvature, were found to coexist. This gives the animal a very large range of accommodation, which is required to enable it to see well both in air and in water.

Beer here turns aside in his paper to point out that his investigations seem to throw light on the question of the mechanism of human accommodation, in this respect, among others, that they render it more probable that it is produced by a relaxation of the tension of the surrounding tissue of the lens by its increased flaccidity rather than by an increase in its rigidity. Thus, in the snake just referred to, and in the truly amphibious terrapins, in which a precisely similar condition exists, it seems certain that the lens increases in its high curvature when the contraction of the peculiar muscle described has freed it from the tension of its suspensory structure. In this snake, and in the turtle, both of which are slightly hypermetropic in the air, the hypermetropia must be greatly increased when under water by the loss of the refractive effect of the corneal curvature. These animals, therefore, in order to see near

objects under water, require a very large range of accommodation, and this their double method of increasing the refraction supplies.

In both the turtle and the lizard family there is a bony ring in the ciliary region and a plate of cartilage in connection with the sclerotic, the relation between which and the zonula determine the form of the lens, so that even when the anterior half of the eye is removed accommodation can take place on electrical stimulation without the ciliary zone taking any part. Obviously, the intra-ocular tension cannot here play the important part which it takes in softer-coated eyes. In most of the families of the reptilia, the range of accommodation is large, varying from 10 to 15 D., which enables them to obtain clear images from a very few centimetres' distance—a fact of great importance to those lizards which feed off small insects which have to be snapped at with rapidity. The crocodiles, on the contrary, have a very feeble degree of accommodation, although under water they must have a hypermetropia of 15 to 20 D. In those animals of the reptile, fish and amphibian orders which are nocturnal in their habits, the range of accommodation seems always to be small, and the pupils are able to contract to excessive minuteness. During the night it is impossible to obtain clear images at any rate, therefore their range is but small; during the day the excessively small pupil cuts off circles of diffusion, and their highly sensitive retinæ appreciate even the dull images received.

In the birds, along with a large field of vision and two places of most distinct vision in each retina, the accommodation apparatus reaches high development. The ciliary region is strengthened by a ring of bone, the striped ciliary muscle is of large size and the soft lenses well adapted for free and rapid change of curvature. It is said to be in the eye of the bird that the muscle of accommodation was first described (in 1815 by Crampton); it is attached to the bony ring above mentioned, to the inner surface of the margin of the cornea and to the ligamentum pectinatum. Its action was not, of course, at first properly understood and correctly

explained, as is well known, but into such matters we need not enter here. Accommodation takes place in the eye, which at rest is emmetropic or lowly hypermetropic, by increase in the curvature of the lens, especially of its anterior surface. This is not due to any action of the iris or of ciliary processes surrounding it, but is brought about on the same principle as in the turtles and lizards, that is by a relaxation of the tension of the suspensory structures of the lens, permitting it to adopt its attitude of rest. It can be shown that the curvature of the lens, after cutting off the iris and cornea and electrically stimulating the ciliary muscle, agrees with that observed when the whole investing structures of the lens are removed and it is allowed to adopt its attitude of rest. In birds the iris can be shown by removal to have no influence whatever upon accommodation, but, on the other hand, if the ligamentum pectinatum and Crampton's portion of the ciliary muscle are well developed, they have a more important function in the mechanism of accommodation than has the tensor portion of the ciliary muscle and its "pull" upon the choroid. It seems probable rather that some backward action is exerted upon the innermost layers of the cornea at its periphery. Beer believes there is a strongly accentuated difference between mammalian and birds' eyes in this matter; in the former accommodation involves a drawing forwards of the choroid; in the latter, in whom alone Crampton's muscle is well developed, this does not occur, but the most internal layers of the cornea are, as just mentioned, drawn backwards. In many birds, if the ligamentum pectinatum be divided, the lens assumes permanently and immovably its attitude of maximum accommodation. In certain birds, however, Crampton's muscle is comparatively small, while a tensor choroideæ (Brücke's muscle) is present; in these the condition of affairs approaches that of the mammalian eye.

In the mammal, there is no bony ring round the ciliary region such as there is in creatures of less advanced development, and by removal of portions of the cornea and sclera it may be shown clearly that increase of the tension of

the eye by the ciliary muscle has no place in the mechanism of accommodation, such as it has in some of those others. It is also readily capable of proof that change of curvature of the lens, not change of its position as a whole, determines the amount of accommodation. As regards the range of accommodation in the mammalia, man comes first, then the higher apes, others follow at a very considerable interval. In the cat and other carnivora it attains the highest degree among those of the lower orders of mammals; it is large also in the seal and the otter. In many animals it seems to bear a relation to the size of the head and the "eating distance;" thus it is with the small-headed reptiles and birds, which have a large range of accommodation, and with the small apes, which have a large range as compared with the elephant. As a general rule, too, the large-eyed mammals—the solipeds, the ruminants, and whales—have less need for accommodation than man, and have only a range of $\frac{1}{2}$ to 2 D., as may be proved ophthalmoscopically. It is worth note here that under domestication some of the ruminants, *e.g.*, the ox, are apt to develop myopia. In many of the carnivora, especially the sharp-sighted large felidæ, the range of accommodation is of necessity much larger. By electrical stimulation of the freshly enucleated eye of the common cat, it is easy to demonstrate the increased projection of the anterior surface of the lens; yet here the increase of refraction amounts to only 2 or 3 D., and the degree of projection of the lens compares very unfavourably (as Beer's diagrams clearly show) with that which occurs in the much smaller eyes of many birds, of the lizard and the turtle. The range of accommodation in the dog and fox is similar to that of the cat; while in a monkey (*Macacus rhesus*) it was found to be 10 D.; and in the anthropoid and some other apes it is larger still, approaching even in the tailed apes to the degree present in man.

In the horse and dog the refraction is usually hypermetropic and their accommodation but feeble, as indeed is probably true also of many, even of the free-living, non-domesticated mammals, so that their near point cannot

be nearer than one or two metres away; in fact, in the horse accommodation was for long believed to be non-existent. Whereas a sparrow will look at an almost microscopic crumb, and a small singing bird at a minute insect, at the distance of a few centimetres, and pounce on it with accuracy, a dog makes much more use of scent than of sight, and seeks an object on the ground near it rather by the former than by the latter sense; the dog sniffs round in circumstances where a man or a bird would gaze round.

In the case of the seal and other aquatic mammals, a very large range of accommodation would be required to enable them to see under water, since the similarity in the refractive index of water and the cornea must render them highly hypermetropic. In many of the rodents the ciliary muscle is very poorly developed, and they seem to possess little or no accommodative power; in both the hare and the rabbit Beer totally failed to discover any change in refraction either after administration of myotics or after electric stimulation.[1]

It is convenient for reference and similar purposes to sum up the results of these investigations somewhat thus:—

(1) Aquatic animals with highly developed eyes, such as the cephalopods among the invertebrata and the bony fishes among the vertebrata, have their static refraction myopic and accommodate actively for distance by bringing the globular lens into nearer approximation to the retina, without altering its curvature, but the mechanism by which this is brought about is quite different in these two classes.

(2) In the cephalopods a special muscle attached to the lens draws it back against the contents of the eye, while a portion of the wall of the globe behind this ring-shaped muscle yields to the internal pressure; the shape of the globe is altered and the lens approaches the retina.

[1] See Note on "Accommodation in the Rabbit" in the forthcoming number.—Ed. *O. R.*

(3) In the fishes a small short muscle, the retractor lentis, is present, springing from the wall of the globe, which draws the lens downwards and backwards and causes it to approach the retina.

(4) In the aërial vertebrates the eye is adapted for distance, and those which are able to accommodate at all do so for near objects.

(5) In the higher vertebrata, accommodation for near objects takes place on two principles, by increased separation of the unchanged lens from the retina (amphibia and reptilia), and by increase in the curvature of the lens, especially as to its anterior surface (certain reptiles, the turtles, crocodiles, lizards, birds and mammals).

(6) In the reptiles in which there is no ciliary muscle, a special muscle is developed which pushes forward the lens by increasing the pressure behind it.

(7) The mechanism of accommodation in all the higher vertebrates, from reptiles up to man, is the same in aim, viz., to increase the curvature of the lens, though it may differ in detail of working. The function of the ciliary muscle is to relax the tissues surrounding the lens, so that it may assume its attitude of maximum curvature, the increase being greatest in respect of the anterior surface.

(8) In every class of animal, except the Cephalopoda and Aves, there are species in which accommodation is absent altogether or is very feeble. Most of those exceptional animals are nocturnal in their habits, and have extremely minute pupils during daylight. Of course, in animals which live constantly in burrows or underground, and where the eye is scarcely at all developed, accommodation is absent.

(9) There is no eye in the animal world adapted when at rest for sight equally in air and in water. Animals which spend their lives under water are highly myopic in air; aërial living animals are highly hypermetropic in water.

(10) Only a very few truly amphibious animals, which "make their living" in both elements, such as the Terrapin (Emys) have so great a range of accommodative power as to be able to see well in the air, and yet see near objects clearly under water.

It is probable that those animals in which accommodation is obtained by a change in the distance separating lens and retina (cephalopods, fishes, amphibians, reptiles), unlike those in which it is obtained by an alteration of the curvature of the lens (turtles, saurians, lizards, birds and mammals), have the advantage that they cannot become presbyopic.

W. G. S.

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PANAS (Paris). Complete Keratectomy. *Arch. d'Ophtal., September*, 1898.

In this article Panas describes an operation which he terms *keratectomie totale combinée*, and gives his experience of it in 200 cases. The majority of these he has been able to follow for a period of eight years, and hence feels justified in expressing a decided opinion as to the results of his method. The cases for which he considers this procedure especially applicable are those of anterior staphyloma, generally complicated by secondary glaucoma, and of absolute glaucoma. He first performed this operation seventeen years ago, and having lately seen the patient, ascertained that the stump had never been a source of trouble, and during the long interval since the operation had undergone scarcely any diminution in size.

Nine years after the first case Panas began to perform the operation systematically, and he states that in no case (of 200) has sympathetic disease supervened. The cosmetic result has been very satisfactory.

The operation, as will be evident from the description which follows, differs essentially from that of George Critchett, and Panas believes is in many ways a safer proceeding. The hæmorrhage from the ciliary arteries, often troublesome in the old abscission operation, is avoided in the present plan.

The details of the operation are these. The patient should be deeply anæsthetised, to prevent any straining efforts. The eyelids are controlled by a speculum, and a curved Reverdin needle is passed into the globe at the sclero-corneal junction, carried behind the iris and lens, and brought out on the opposite side through a corresponding point in the *limbus corneæ*. The needle is then threaded with silk, but is retained for the present *in situ*. The cornea is resected in $\frac{4}{5}$ of its circumference, at its extreme margin, by a Graefe knife, the remaining $\frac{1}{5}$ being divided by scissors. In staphylomatous eyeballs, the greater part of the iris, which is closely adherent to the cornea, is removed by this incision, but in purely glaucomatous eyes the iris should remain in position, and after removal of the cornea should be pulled away in its entirety by forceps. Next, the crystalline lens is removed entire by a cataract spoon, and in order to prevent as far as possible loss of vitreous, the lid-speculum should during this step be held away from the globe by an assistant. All that now remains is to suture the edges together. The threaded needle is withdrawn and the silk tied, bringing the margins together. Then two more curved needles, armed with silk sutures, are passed through the sclero-corneal edge and tied. To make the anterior surface of the stump more suitable as a support for an artificial eye, the two lateral angles of the line of suture are smoothed off with scissors.

The wound and its surroundings are carefully washed with a solution of biniodide of mercury 1 in 20,000, and powdered over with iodoform; iodoform or similar gauze is placed over the eyelids, and a pad and bandage above this. The dressings are left undisturbed for three days. The stitches are removed about the seventh day, but the bandage continued for eight to ten days longer, when it will be found that cicatrisation has taken place without pain, swelling or any reaction.

From measurements made on the cadaver, Panas finds that by this operation the globe loses $\frac{1}{5}$ of its volume, and allowing for subsequent shrinkage in the living subject, he

calculates that the stump is quite $\frac{3}{4}$ the size of the healthy eyeball. This loss in volume would be amply compensated by the glass eye worn over the stump.

Of the 200 cases quoted by the writer, 50 were from 9 to 15 years of age, 110 between 15 and 30, and 40 were more than 30 years old; 150 of the eyes were staphylomatous and glaucomatous, while in 50 cases the condition was one of absolute primary glaucoma.

For such cases Panas strongly recommends this operation. In cases of panophthalmitis he prefers exenteration.

He concludes his paper by giving some illustrations and measurements of eyes of dogs upon whom he had performed keratectomy.

J. B. L.

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DE LAPERSONNE (Lille). The Orbital Manifestations of Sinusitis. *Archives d'Ophtalmologie, June,* 1898.

The author draws attention to three particular points in regard to inflammation of the frontal sinus. (1) Neuralgia of the ophthalmic nerve is apt to be the mistaken diagnosis, for neuralgic attacks recur at intervals, especially in the morning, in some instances returning almost at a certain hour; the pain is continuous, but with violent exacerbations, in which the whole region presided over by the ophthalmic nerve is involved, the pain darting all over that area. At the same time there is lacrymation, injection of the conjunctiva, and photophobia, all of which become redoubled on any attempt to use the eyes for near objects. The attack passes off after lasting a few hours, and is renewed next morning for about the same length of time. In presence of such symptoms it is well to be on one's guard lest inflammation of the sinus be present, and not a simple neuralgia. From his own experience of such cases

the present writer can corroborate the statements of De Lapersonne in this matter. (2) The apparent severity of the very acute cases, leading to abscess formation in the orbit, to the casting off of sequestra of considerable size, and yet finally ending in complete and sound cure, without leaving a fistula. (3) The great difficulty of avoiding the establishment of a fistula in the chronic cases. In fact, we see the same march of events that we see in cases of dacryocystitis—the severe, even the violent, acute cases leading to rapid pus formation in (and round ?) the sac, ending in complete recovery without fistula or stricture ; the chronic slow cases leading so frequently to the formation of a fistula which it is so difficult to avoid or to cure when once established.

Inflammation of the frontal and ethmoidal sinuses is not infrequently followed or accompanied by similar condition of the maxillary sinus, and by suppuration in the cellular tissue of the orbit ; to the orbit the affection may spread either by venous or by lymphatic paths. But besides those cases others occur which are not so easy to understand, in which, without any apparent affection of the orbital contents, the field of vision becomes restricted, and optic atrophy or irido-choroiditis is to be seen with the ophthalmoscope. In such a state of affairs the past or actual presence of a sphenoidal sinusitis may be suspected ; some of the supposed "reflex amblyopias" may be of this class in reality.

W. G. S.

# ON ACCOMMODATION IN THE RABBIT.

By Priestley Smith.

Professor of Ophthalmology, Mason University College, and Ophthalmic Surgeon, Queen's Hospital, Birmingham.

As the result of much laborious observation and experiment, Barrett[1] has come to the conclusion that, with the exception of man and the apes, the mammalia have practically no power of accommodating their eyes for different distances. Even if there were no good evidence to the contrary, it would be difficult to accept this conclusion as final, for these animals possess a mechanism similar in kind to that which effects accommodation in the human eye, and there is good reason to suppose that they, like ourselves, need to see clearly at varying distances, though for many of them, probably, a shorter range than that which we enjoy may suffice. But we need not dwell on this presumption. The still more extended observations of Beer,[2] while they agree with those of Barrett in showing that the apes are probably the only mammals whose range of accommodation approaches that of man in extent, give no support to the idea that the others are devoid of the faculty; on the contrary, they indicate that all animals whose eyes are built on the camera type are provided with a range of accommodation adapted to their special

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[1] Ophthalmic Review, September, 1898, p. 255.

[2] *Wiener Klinischen Wochenschrift*, 1898, No. 42. Abstract in Ophthalmic Review, September, 1898, p. 272.

needs. In hares and rabbits only did Beer fail to find evidence of accommodation. Hess and Heine[1] also found active accommodative power in various mammals, viz., in certain apes, a range equal to 10-12 D.; dogs, 2·5-3·5 D.; cats, 1-2·5 D.; a young wolf, 2·5-3·0 D.; rabbits, 0. The object of the present paper is to show that even in the case of the rabbit these negative results were misleading. I have been able to demonstrate a considerable accommodative action in the rabbit's eye.

So long ago as the year 1873[2] I made the experiment of passing a weak Faradic current through the freshly excised eye of the rabbit and observing through a microscope the effect produced upon the reflex from the anterior surface of the crystalline lens. It exhibited the characteristic movement of accommodation. This observation gave indirect evidence of accommodative action, but it did not exhibit the actual change in the refraction of the eye, or afford any measure of its amount. The shadow test was at that time unknown. Since reading the statement of Beer with regard to the rabbit, I have taken up the question again with the aid of the shadow test, and have observed an accommodative change of at least 4 D. The first trial, however, gave a nearly negative result, and it was only by discovering and eliminating certain sources of non-success that I was able to bring these later experiments into harmony with those made many years ago with the phakoscope. This experience may perhaps explain the negative results obtained by other observers.

The essential points in the earlier experiment were as follows. A rabbit, after having a few whiffs of

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[1] *Von Graefe's Archiv*, vol. xlvi., part 2, p. 243. Abstract in OPHTHALMIC REVIEW, August, 1898, p. 253.

[2] *British Medical Journal*, December, 1873, p. 657.

chloroform, received by subcutaneous injection a lethal dose of chloral hydrate (20 grs. = 1·3 gramme). During deep anæsthesia, but before respiration and circulation had ceased, the eye was excised. It was dipped in warm olive oil in order to hinder evaporation and preserve the brightness of the cornea, and placed in the holder shown in the accompanying figure (fig. 1). The upright supports carrying the two

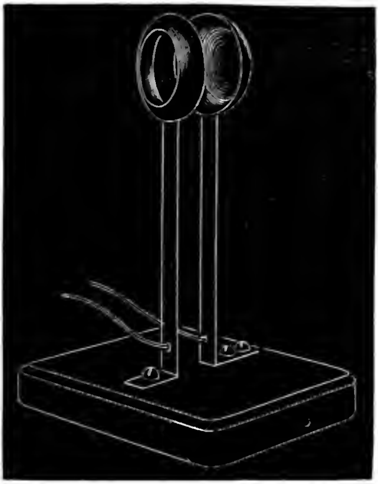

FIG. 1.

parts of the holder being made of thin flexible metal could be drawn apart for the introduction of the eye, and were severally connected with the wires of a small battery giving a weak interrupted current, so that the circuit was completed by the passage of the current through the eye in an antero-posterior direction. Hot bricks were placed near to the eye to keep up its temperature.

Reflexes from the cornea and anterior lens surface were afforded by a small gas flame. They were ob-

served through a microscope magnifying 8 diameters and having a micrometer scale each division of which corresponded $\frac{1}{32}$ to of an inch (·8 mm.) in the object. When the microscope and the flame were placed on opposites sides of the corneal axis, and each at an angle

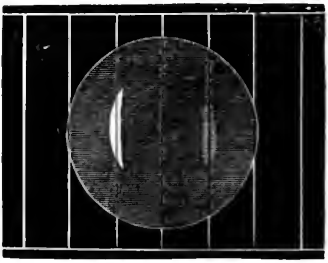

Fig. 2.

of 35° with it, the reflex from the anterior lens surface was well seen. To prove that it was not produced by the posterior lens surface it was only necessary to observe that it moved in the same direction as the corneal reflex when the flame was moved.

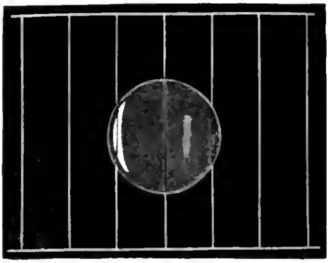

Fig. 3.

During the first minute or two after the removal of the globe from the orbit, the current produced no movement either of pupil or lens reflex ; there

appeared to be a condition of spasm ; the pupil was small and the lens reflex stood in the position which it afterwards assumed during galvanic stimulation. Soon, however, both became mobile, the pupil a little while, perhaps a quarter of a minute, before the lens reflex.

Figures 2 and 3 show the positions of pupil and lens reflex during non-stimulation and stimulation respectively. The brighter reflex is that from the cornea ; it remained stationary throughout. The duller one is that from the anterior lens surface ; it travelled towards the corneal reflex by just half a micrometer space (·4 mm.) when the electric current was sent through the eye. This movement was seen very many times during a period of an hour and three-quarters. It was seen by Mr. Lloyd Owen and Mr. Frederick Maberly as well as by myself. Many times in succession it seemed to be invariable in every way. The movement occupied an appreciable time, and the reflex always assumed the same positions so far as the eye could discern. A very weak current caused it to move the full distance ; a stronger current drove it no farther.

The movements of the pupil did not completely correspond with those of the lens reflex. On breaking the circuit the pupil usually dilated to rather more than its permanent size, then contracted slightly within it and made several oscillations of this kind before assuming the diameter seen in the figure. The lens reflex, on the other hand, made a single non-oscillatory journey. At the beginning of the experiment the pupil became mobile a little earlier than the lens reflex. At the close it continued to be slightly influenced by the current for several minutes after the lens reflex had become fixed.

At the present time it would be a violation of the

law—unless under a licence, which I do not hold—to inject chloral and to operate before the animal ceases to breathe, as in the original experiment, although this, be it observed, was an absolutely painless procedure. In returning to the question I therefore adopted a different method. Chloroform was given until the rabbit was dead, and the eye was then excised.

In the first eye the electric current gave an almost negative result. The pupil was strongly contracted when the eye was placed in the holder, and remained so for many minutes. It enlarged later, and contracted slightly a few times when galvanised, but soon became irresponsive. The shadow test showed a slight change of refraction in association with the action of the pupil, but it was altogether insignificant as compared with the definite and lasting action obtained in the earlier experiment. The second eye of the same animal, excised half an hour after death, responded to the current more actively and showed more than once a change of refraction equal to about 4 D., but again the action came quickly to an end instead of persisting for an hour or more, as my former experience had led me to expect.

Suspecting that a fall of temperature in the eye might account for its imperfect reaction to the electric current, I repeated the experiment with the addition of a steam chamber which maintained a temperature of about 100° F., as indicated by a thermometer placed close to the eye. But the eye was even less responsive than the previous one. In this case, however, as before, the second eye, excised more than half an hour after death, reacted somewhat better than the first.

Reconsideration of the matter showed me that I had disregarded certain principles which govern the maintenance of irritability in muscles after their removal

from the body.[1] Other things being equal, the exhaustion of a muscle is great in proportion to the strength of its previous contraction. A given stimulus induces a stronger contraction at the normal temperature of the blood than at a lower temperature. Hence a muscle removed from the body and thrown into a state of spasm exhausts itself more rapidly at a temperature of 98° or 100° F. than at lower temperatures. Further, the maintenance of contractile power is promoted by the presence of oxygenated arterial blood; opposed by the presence of venous blood. A muscle removed from the body is exhausted most rapidly when it is loaded with venous blood. Obviously the conditions of my experiment were eminently unfavourable. The eye was excised as soon as possible after death, *i.e.*, before the temperature had fallen and while the muscle still presented its maximum irritability. The division of the ciliary nerves induced a strong and long-continued spasm of iris and ciliary muscle which, when it subsided, left an extreme exhaustion, and the venous congestion due to the chloroform precluded the possibility of any considerable recovery of contractility. The better result obtained in every instance with the second eye was due, no doubt, to the fall of temperature which occurred before the second excision.

For the avoidance of these drawbacks, therefore, a rabbit was killed by decapitation instead of by chloroform, and fifteen minutes were allowed to elapse before the eye was removed from the head. The hot chamber was done away with. The current employed was extremely weak—it could be tolerated by the tip of the tongue. The results were now very different. The

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[1] See Michael Foster's "Text-book of Physiology," chap. 2, sect. 5, The circumstances which determine the degree of irritability of muscles and nerves.

initial spasm due to the excision was much shorter, and the subsequent irritability of the iris and ciliary muscle was much longer maintained. I was now able many times in succession to get an active response in the iris and a very obvious increase of refraction with the electric current. In order to preserve the smooth polish of the cornea, olive oil was applied to its surface with a camel-hair brush.

For the measurement of the accommodative change I found it best to fix before the rabbit's eye such a glass as would bring its far point to half a metre or even less, and to place my own eye exactly at this point, as determined by the neutral movement of the shadow, *i.e.*, movement neither definitely *with* nor definitely *against* that of the mirror,—in several cases it was necessary also to correct some amount of astigmatism produced by the unequal pressure of the metal holder, —and then, on the occurrence of the accommodative change, to add such a concave glass as would restore the neutral appearance. I saw a change of 4 D. several times, and in one or two instances there seemed to be more than this.

Among a total of eleven eyes examined with the shadow test and the faradic current there was not one which entirely failed to exhibit an accommodative change, though in several it was slight and very transient. Under the more favourable conditions it was definite and obvious. The result, on the whole, was conclusive as regards the question at issue, but differed decidedly in one respect from that recorded years ago—the responsiveness of the eye was in no case so persistent as in the earlier experiment. What was the cause of this difference? I suspect that in the earlier experiment I had chosen, without knowing it, a method peculiarly favourable to the persistence of muscular irritability. Chloral in lethal dose induces

an ideal euthanasia : the animal falls asleep, becomes profoundly anæsthetic, and then gradually ceases to breathe, without the slightest convulsive disturbance. The temperature is probably lowered considerably before death, a change highly favourable to the maintenance of muscular contractility after death. Excision performed before the circulation had stopped would find the eye comparatively free from the venous engorgement which accompanies chloroform asphyxia.

That the rabbit has a potential faculty of accommodating is fully proved by these experiments. To what extent he makes use of it is another question. It may be suggested that he uses it simply for the purpose of correcting some hypermetropia and thus obtaining clear distant vision. Of six rabbits, which I took some trouble to observe with the shadow test in their normal live state, four appeared to be about emmetropic, or perhaps hypermetropic to the extent of one dioptre ; two, and these were younger than the others, appeared to be myopic, but this may have been during accommodative effort. In several cases I saw the eye change from a state of approximate emmetropia to one of considerable myopia. The difficulty in getting the rabbit to accommodate appears to depend on his being attracted by the light from the mirror and disinclined to give his attention to any nearer object while he can look at this light. By gradually approaching him, however, keeping the light still upon the eye, one can sometimes induce an obvious accommodative change ; the neutral shadow movement observed at one metre or more is still observable at a much shorter distance, a proof that the animal has accommodated his vision in accordance with the approach of the observer.

It remains only to ask why certain experienced

observers failed to get a positive result with the electric current. The reason must lie in the method of the experiments. Much certainly depends on conditions of temperature and circulation, whereby exhausting action at the outset is avoided. Something may perhaps depend on the manner of transmitting the current through the eye. A cup-shaped holder such as I employed would probably diffuse it better through the ciliary muscle and iris than wires or needles applied to opposite parts or isolated points of the ciliary zone. In dealing with the eye of the rabbit these minor details may be of more moment than in the case of other animals, for the rabbit's ciliary muscle appears under the microscope to show a relatively feeble development.

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**E. Pergens (Brussels). A Case of Cyanopsia.**
*Annales d'Oculistique. August*, 1898.

Of the various forms of coloured vision, erythropsia is much the most frequent. Green vision (chloropsia) has been observed and recorded in about a dozen cases, in some of which red and green vision alternated, and in some cases retinitis was present. It is uncertain whether the cause is always central or peripheral. Yellow vision (xanthopsia) has also been recorded about fifteen times [But does this represent anything like its real frequency ?—W. G. S.] some part of which were of central, some of peripheral origin. Janthinopsia, or violet vision, has been recorded on one occasion only—in a woman of 55, who had hallucinations of hearing and of smell, as well as of sight. Cyanopsia, or blue vision, is now put on record for the

ninth time ; for the references to the previous eight cases, Pergen's paper should be consulted. The following is a brief account of the case :—A gentleman aged 44, of good health, was brought home—after very copious libations of alcohol—extremely intoxicated; and thereafter slept for about twenty hours consecutively and vomited twice. On coming to himself, he suffered, of course, from great oppression in the head, and objects appeared blue to him. This symptom existing in spite of tea, soda-water, brandy and "pick-me-ups," he consulted Pergens, who found no obvious cause. The fundus, pupil reactions and accommodation were normal, as well as the light sense, refraction, vision and tension ; even when one eye was closed the blue colour remained of the same intensity. When he was tested with Helmholtz's colour types, red appeared as purple, orange as red, yellow was darkened, green was a greenish gray, blue was intensified, violet was seen normally. Tested with the spectroscope, blue and orange appeared to him the most luminous. The leaves on the trees and the yellowish gray sand of the boulevards seemed as though covered with hoar frost when the sun shone brightly; in the shade the leaves took on a brownish autumnal tint. The faces of persons passing near him (ten to twelve feet away) seemed fairly normal, those further away appeared darker and darker, until at forty feet or so the visage was as dark as that of a negro. A lotion only was ordered as a placebo, and in four days all the blue colouration had passed off. In this case at least there could be no doubt of the central cause of the symptom, although some of the other cases on record are more doubtful.

W. G. S.

**Deyl (Prague). A New Explanation of the Choked Disc.** *Transactions of International Medical Congress of Moscow*, 1898, *Section for Ophthalmology, p.* 41.

The condition formerly known as choked disc (stauungs-papille) includes the following changes: œdema of the papilla, enlargement of the intervaginal space behind the eye, and multiplication of nuclei in the connective tissue septa, and the sheaths of the vessels. The nature of the process is variously explained. Some authors regard it as a primary œdema of the optic nerve, which is to be considered as an orbital prolongation of the brain. Others suppose that intracranial pressure forces an excess of cerebro-spinal fluid into the intervaginal space of the nerve, and in this way induces œdema of the papilla. Others, again, point especially to the multiplication of nuclei and assume that brain tumours produce a phlogogenetic substance which infects the nerves and sets up in them inflammation and consequent œdema.

Deyl, starting with the clinical observation that the swelling of the papilla begins with overfilling of the veins, has sought to determine the point at which the hindrance to the escape of the blood arises. Making an unbroken series of sections of nerves presenting the condition in question, he satisfied himself that the strangulation of the vein begins neither at the papilla, nor in the axial course of the vein, nor in its transit across the vaginal space, but at the point where it passes through the dural sheath of the nerve. This sheath is separated from the nerve by the dropsical accumulation within it, and by its displacement causes the vein to be sharply bent and compressed where it passes through it. Within the sheath he found the vein dilated, but in the thickness of the sheath itself, compressed and almost impermeable. In some cases the vein may be compressed by granulation tissue or hæmorrhage in the intervaginal space, or through retrobulbar inflammation of the nerve affecting the anterior part of the nerve trunk, and especially the inferior nasal portion

through which the central vessels pass. The situation of the vessels varies much in different nerves; the point of entrance is from 6 to 15 mm. behind the globe, the direction is sometimes vertical to the sheath, sometimes oblique. The sheath is thicker and harder in the adult than in children.

The multiplication of nuclei is not, the author declares, a proof of primary inflammation. In the early stage of the œdema it is inconsiderable. In the later stages it is to be regarded as a result of passive congestion, and finds an analogy in cardiac cirrhosis of the liver. In the nerve, as in the liver, a considerable œdema with proliferation of nuclei, due to passive congestion, may co-exist with an almost undistubed function, a state of things very different from that which occurs from infective inflammation.

Against the infective theory of optic neuritis the author, following previous writers, raises several objections, viz., that in cases of intraocular and orbital tumours similar to those which, when seated in the brain, set up optic neuritis, the disc-changes are commonly absent; that papillitis is often absent in cases of meningitis and cerebral abscess where an inflammatory process is manifest, and that non-inflammatory disorders, such as aneurism of the internal carotid and the growth of osteomata, sometimes induce it. Lastly, he would explain the results obtained by Deutschmann, who induced papillitis by injections into the vaginal sheath, by the supposition that the injected material acted by causing a direct compression of the vein close to the papilla, rather than by establishing an infective inflammation, evidence of which latter, in the form of neuritis or perineuritis, was not discoverable.

P. S.

**Frenkel** (Lyon). **Researches on Renal Permeability in the Subjects of Senile Cataract.** *Archives d'Ophtalmologie, July*, 1898.

In a previous research, based on the examination of the urine of 259 patients, the subjects of primary cataract, the author found a diminution both in the total quantity of urine and in the percentage of urea. This might be due either to an alteration in renal permeability or to an alteration in the nutritive exchanges of the tissues. The present paper attempts to show that the former is the correct explanation. The method of investigation is one which, since April, 1897, has been employed in France in connection with kidney disease. It consists in the injection with a sterilised instrument of 1 cc. of a 5 per cent. sterilised solution of methylene blue, deeply into the gluteal muscles of the patient immediately after the evacuation of the bladder. The urine is then examined at intervals—at first of half an hour, afterwards at longer intervals, for the appearance of the colouring matter. The points to which attention has hitherto been directed are (1) the interval between the injection and the first appearance of colouration in the urine; (2) the time of maximum elimination; and (3) its total duration, *i.e.*, the interval between the first appearance of the colouring matter and its final disappearance. The subject is complicated by the circumstance that whenever the urine is alkaline, the blue is eliminated not as blue but as a "chromogen." Moreover the liver, and possibly other organs, may exercise a varying activity in the reduction of the blue. These considerations obviously make any comparison extremely difficult, more especially a comparison between the experiments of different investigators. One authority gives the normal period of elimination as from thirty-five to fifty hours; another as from forty-eight to seventy-two hours. The fact that in thirty-two cataract cases the average period was greater, and that in four of them the period exceeded seventy-two hours, may possibly be of some significance, but hardly

justifies the author when he asks us to admit a diminution of renal permeability in these cases. Moreover, in eight out of the thirty-two cases the period was not lengthened. These are accounted for by attributing the cataract in these cases to special causes—to diabetes in two cases, to irido-choroiditis in one, and to excessive heat in two.

The objection naturally occurs that if we take senile cataract alone, it is the senility rather than the cataract which is connected with any impermeability of the kidneys that there may be. The author attempts to answer this objection thus:—Experimenting on three non-cataractous old men he found a diminution of renal permeability, but not such a great diminution as in cataractous patients of the same age. Comparing the cataractous patients among themselves it was not always the oldest in whom the diminution was most marked; and comparing them with three cases of irido-choroiditis in old men without cataract, he found in the latter no diminution. In speaking of renal permeability in this connection, the words apply solely to the kidney tubules, not at all to the glomeruli.

On the whole, considering the numerous possible sources of error and the small number of observations, this paper is decidedly inconclusive.

A. H. THOMPSON.

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**R. T. WILLIAMSON (Manchester). Diabetes Mellitus and its Treatment.** *Edinburgh and London: Young J. Pentland.* 1898.

It would be out of place to review this work in its entirety in an ophthalmic journal. This has been done in a very complimentary way in other periodicals; and we would add our congratulations to the author on the production of a very excellent book. Although the subject of diabetes mellitus is one whose chief interest is for the physician, a considerable proportion of the cases of this

malady come under the observation of the ophthalmologist at some period of their course. The author's work deals with the ocular complications of diabetes at greater length than any other *medical* work with which we are acquainted; and it is to this portion of the book that we desire to direct attention, and upon it that we venture a few criticisms.

The chief fault we have to find is that the space devoted to ocular lesions is not larger. The section, brief though it is, contains much that is of great value alike to the physician and to the ophthalmic surgeon.

Williamson gives as ocular affections which are "directly caused by the disease," cataract, paralysis of accommodation, shortsightedness developing between the ages of 40 and 60 without lenticular opacity, vitreous opacities, retinitis, amblyopia like tobacco amblyopia. He adds that the following ocular affections have also been met with in diabetes, but that "probably most, if not all, of these are mere accidental complications;" diplopia due to paralysis and paresis of ocular muscles, loss of convergence power, iritis, corneal inflammation, conjunctival hæmorrhage, furuncles and eczema of the eyelids, hemianopia. With this latter statement and list we cannot wholly agree. There can be no reasonable doubt that there is a diabetic iritis, and also that paralysis or paresis of ocular muscles occurs as a genuine result of the diabetic condition. Leber especially, and other observers also, have shown that inflammation of the iris is not an uncommon complication of diabetes, too frequently so to be a mere coincidence. Probably the physician is less likely than the ophthalmic surgeon to see cases in which iritis or ocular paralysis occurs.

Williamson writes chiefly concerning diabetic cataract and diabetic retinitis. In 100 consecutive cases of diabetes he found cataract in nine, the ages of the affected patients varying from 12 to 59. Retinitis was present in seven of the 100 cases. In three of these the urine contained so much albumen that kidney disease could not be excluded as a cause of the retinal changes; in two there was only a trace of albumen, and no other signs of

nephritis; in two albumen was absent. He adopts Hirschberg's classification of the varieties of retinitis in diabetes. He is of opinion that the frequency of retinitis in diabetes has been over-estimated, and thinks that the statements in many text-books of medicine may lead readers to suppose that retinitis occurs as commonly in diabetes as it does in chronic Bright's disease; "as a matter of fact, diabetic retinitis is rare." The differences between diabetic and albuminuric retinitis are clearly given in the book before us in tabular form. Williamson does not consider the onset of retinitis in diabetes of such grave prognostic significance as most writers. He concludes his account of the ocular complications by a short description of central amblyopia in diabetics, and a reference to its close analogy to tobacco amblyopia. Three original illustrations of diabetic retinitis are given.

## ABSTRACT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETY, HEIDELBERG, 1897. *Wiesbaden, J. F. Bergmann.*

E. Krueckmann (Leipzig). *Pathology of Choked Disc.*—The author formulates the following conclusions:—

(1) The occurrence of papillitis in cerebral affections is rendered possible by the anatomical connections and relations between the peripheral end of the optic nerve and the brain; (2) Increased intra-cranial pressure favours its developement; (3) Choked disc is both anatomically and clinically an inflammation; (4) The exciting agent of the inflammation is probably somatogenous and autogenous when the visual defect is slight, or when it becomes decidedly less after removal of the primary cause; (5) The somatogenous and autogenous origin of the infective agent cannot always account for slight lesions of function. We must assume that the exudation being of a fluid nature is easily absorbed.

As regards the first conclusion the facts are well known. The cerebro-spinal fluid forms a sort of bath around the optic nerve, which as it were stagnates at the scleral ring, and it probably makes its way into the papilla itself also by means of the sheaths of the central vessels. The evidence for the second is the frequency with which intra-cranial pressure is found in *post-mortem* dissections of these cases, and the fact observed by Schweigger and Elschnig, that the lamina cribrosa is often distorted with a convexity forward. Also the clinical experience that after subsidence of high intra-cranial pressure the choked disc usually decreases. A typical choked disc is never seen in intraocular tumours even when extensive exudative and degenerative changes have occurred, and in these cases the lamina cribrosa is convex backwards. Every case of choked disc examined by Krueckmann exhibited microscopically signs of inflammation, and he also notes that the microscope never failed to demonstrate meningitis as well.

From the character of the inflammation as well as from other considerations it is obvious that it is not induced by the pathogenic micro-organisms, and we must assume that the cells of the human body have the power of producing an inflammatory toxin, which we therefore regard as somatogenous or autogenous in origin. This is the view which was advanced by Leber.

L. HEINE (Marburg). *Accommodative Displacement of the Lens.*—If there is a displacement of the lens during accommodation, as stated by Hess (*vide* OPHTHALMIC REVIEW, vol. xvi., 1897, p. 8), it must produce an apparent movement in objects at different distances from the eye.

Heine has set himself to observe this movement, and concludes from his observations that it is possible to demonstrate its existence both subjectively and objectively, and that it is impossible to account for the facts except on the assumption of the zonula being relaxed in accommodation. The excursions of the lens in extreme spontaneous accommodation show a capacity of lateral movement mounting to ½ mm., while in accommodation after eserine it amounts to 1 mm.

The observations can easily be repeated. Two threads are stretched horizontally before the eye, one at about the near point, and the other at 1 m. from the eye. If the near one covers the far one with relaxed accommodation there will be seen an apparent movement of the near one upwards when the eye accommodates. The experiment is better conducted by having two dark lines for the distant object, and arranging the apparatus and the eye so that the near thread is seen midway between them.

This movement is seen, as Hess's former experiments would lead us to expect, not alone with upright head but also when the head is turned over to either side, or even upside down; not when the gaze is directed straight upwards or downwards.

Hess and Heine have also observed this falling downwards of the lens in each other's eyes by inspection of the reflected image from the posterior surface of the lens,

and the objective and subjective observations perfectly correspond.

It is needles to state that these observations are quite incompatible with Tscherning's theory, the essential point in which is that the suspensory ligament is drawn tight in accommodation.

Heine exhibited microscopic sections of doves' eyes showing that the suspensory ligament is relaxed in accommodation.

E. v. Hippel (Heidelberg). *The eye at birth.*—The author describes the results of anatomical examination of new-born infants' eyes, hardened in either Mueller's fluid or formol, of which he prefers the latter for everything except the lens.

The abrupt circular fold in the ora serrata described by Lange is a purely artificial product. It does not occur in perfectly fresh eyes placed in formol.

Definite conclusions were not drawn as to the thickness of the cornea or the depth of the anterior chamber.

The form of the lens is not at all near the spherical, as has been stated by many writers. It is distinctly lenticular, with the curve of the posterior surface greater than that of the anterior, as in the adult.

The ora serrata does not differ from that of the adult, as stated by Schoen. The differences observed are due to *post-mortem* changes or the effect of reagents.

The physiological "cup" also is to be seen perfectly developed in the new-born eye, even with the elbow-shaped bend in the nerve fibres.

The fovea is imperfectly developed with but few and short cones in it, and its centre lies as far from the edge of the disc as that of the adult fovea, so that if the infant used it for fixation a marked apparent strabismus divergens would be seen.[1] The optic nerve, too, is incompletely

[1] But the normal infant *does* use his macula lutea for fixation by the time he is a few months old, and *does not* present a divergent strabismus. If the distance between macula and disc is relatively great in the infant's eye, it must be the disc rather than the macula that holds a different angular position in relation to the axis of the globe.—Ed. *O.R.*

developed. Hippel found it devoid of medullary fibres till after the fourth week of life. The absence of medullary fibres has been also observed by Bernheimer.

The occurrence of hæmorrhages in the retina is not uncommon. Von Hippell found them in eight out of twenty-two eyes examined.

C. HESS (Marburg). *Glaucoma of uncommon type, and the effect of accommodation in primary Glaucoma.*—The first case was one of acute glaucoma after non-perforating wound of the cornea in a woman of 64. Sclerotomy failed to give permanent relief, and enucleation followed twelve days after sclerotomy, four weeks after injury.

The lens was found luxated into the anterior chamber, and the iris firmly pressed against it and also against the cornea. Hess concludes from the appearances that the pressure must have first risen in the region behind the iris, and the blocking of Fontana's space, which of course existed, was a secondary occurrence.

The second case was that of a boy of 11, who had profuse bleeding in the anterior chamber after a slight corneal injury, and whose eye had to be enucleated eleven days later on account of acute glaucoma. The boy was a bleeder.

Both chambers and the circum-lental space were filled with blood; the anterior chamber was deep in the centre, but at the periphery the iris was firmly pressed against the cornea.

Hess discusses the causation of the peripheral iritic adhesion without coming to any conclusion.

The action of accommodation on primary glaucoma is regarded by Hess as distinctly good, both from the theoretical and clinical stand-point. In addition to the well-known effect of eserine he mentions a case observed by Cohn, where the act of reading used to cut short recurring attacks of glaucoma. He adheres strongly to Helmholtz's theory of relaxed zonula in accommodation.

In the discussion Sattler related another case where the act of reading similarly cut short attacks of glaucoma.

H. Sattler (Leipzig). *The elastic fibres in the sclerotic.*—This purely anatomical paper describes the course of the elastic fibres in the neighbourhood of the porus opticus.

Th. Leber (Heidelberg). *Riband-like Keratitis.*—Of this there are two varieties, the primary and secondary. The first is an affection of senile eyes, which are also disposed to get glaucoma, but Leber regards the latter as probably not the result of the former, both being effects of a common cause.

The secondary form is found in deep-seated uveal affections, and is the commoner of the two. The occurrence of cataract as a senile affection, and also as the result of uveitis, renders it probable that in both cases nutritive changes due to vascular lesions are the true factors in causation of the different conditions.

Histologically considered there seems no essential difference between the two forms of riband-keratitis.

So long ago as 1849 Bowman demonstrated lime salts in the superficial layers of the cornea, and these salts are to be found also in Bowman's membrane, and in the epithelium as well as in the parenchyma of the cornea. They appear first in the very finest particles, which coalesce to regular lumps, and these masses have usually an organic substratum after removal of the lime by reagents.

Microscopical examination shows that these masses are excrescences from Bowman's membrane, similar to the well known colloid bodies found springing from the chorioidea in phthisical or senile eyeballs. They resemble the latter also in a fine but irregular radial arrangement of the histological elements.

Leber suggests that these excrescences of Bowman's membrane are originally covered by epithelium, although he finds them frequently with loss of epithelium over the surface. He believes the epithelial defect is secondary, but states that he cannot prove it. He also leaves it undecided whether they are or are not the product of cellular activity.

In addition to this new formation in Bowman's mem-

brane, there is found in it a peculiar destructive process accompanied by connective tissue proliferation, in the midst of which the calcareous remnants of the membrane may be seen.

Leber considers that the brittleness and rigidity of the calcareous membranes may account for a good deal of this destruction, and the accompanying connective tissue formation.

The fact that the deposition of these minute chalk granules with the formation of a so-called hyaline substance always occurs in the region of the cornea opposite to the palpebral aperture does not prove that external injury has anything to say to the condition. Leber advances the theory that there is an excess of lime salts in the blood, and that these are deposited in the cornea in consequence of the condensation of the nutritive fluid which takes place there from evaporation.

If this view be correct we would expect to find lime salts deposited in the senile cornea close to the blood vessels, in fact to find them in the arcus senilis. The latter has been shown by Fuchs to consist of fine hyaline bodies, and not to be as was formerly held, a fatty deposit. Leber has since in one case demonstrated the presence of lime salts in a case of arcus senilis.

Leber, in conclusion, suggests the search for lime salts in pingueculæ and pterygia, and states that he has found them in xerosis.

MAYWEG (Hagen). *Sarcoma of Iris.*—The patient was a man of 53, and the tumour had been observed for about six months. The pupil reacted to light, but the iris was congested. Its upper temporal region was occupied by a tumour of about 8 mm. diameter, whose convex border reached the edge of the pupil. Its colour was a dark grey brown, and it was provided with numerous blood vessels. Its consistence was soft, for it could be moved by pressing on the cornea. A few yellow brown pigment spots were in the nasal part of the iris. The tumour was removed by iridectomy *à ciel ouvert*, as described by Gayet, and was found to be a spindle-celled sarcoma.

L. Bach (Wuerzburg). *Paralysis of Ocular Muscles*, an experimental investigation.

The experiments were chiefly made on cats and rabbits. A muscle was divided and partly excised, or the iris and ciliary muscle were completely removed, or the globe enucleated, or the orbit exenterated, and the animal was some time afterwards killed.

The results were as follows: After exenteration of the orbit changes are found in the oculomotorius and trochlearis nuclei of both sides, but more pronounced in the nuclei of the same side. The adducens nucleus only shows changes on the same side.

Division of the rectus externus produces changes only in the nucleus of the same side.

Division of the obliquus superior produces changes in the trochlear nuclei of both sides, but more pronounced in the nucleus of the opposite side.

Division of the rectus superior produces changes principally in the nucleus of the opposite side.

Division of the obliquus inferior produces changes in the nucleus of the same side, principally affecting the posterior (distal) portion of the nucleus. Only very slight changes are found in the nucleus of the opposite side.

Division of the rectus inferior produces only changes in the nucleus of the same side, and the proximal end of the nucleus is chiefly affected. Division of the rectus internus produces changes in the proximal end of the nucleus of the same side. The abducens nucleus is not affected by this section.

Removal of the iris and ciliary body produces changes in the ciliary ganglion but not in the oculo-motor nucleus.

The above are the results in rabbits, which receive confirmation from experiments on cats, and observations on human specimens, normal and pathological.

It may be observed that there is hardly a single point of agreement in the observations of Bach, and those of Bernheimer in the following paper.

St. Bernheimer (Vienna). *Innervation of Ocular Muscles*, an experimental study.

The experiments were made on apes, and were similar to those performed by Bach, the animals being killed shortly afterwards.

The results are briefly as follows :

The centres for the rectus superior, internus, inferior, and for the obliquus inferior, are in the lateral principal

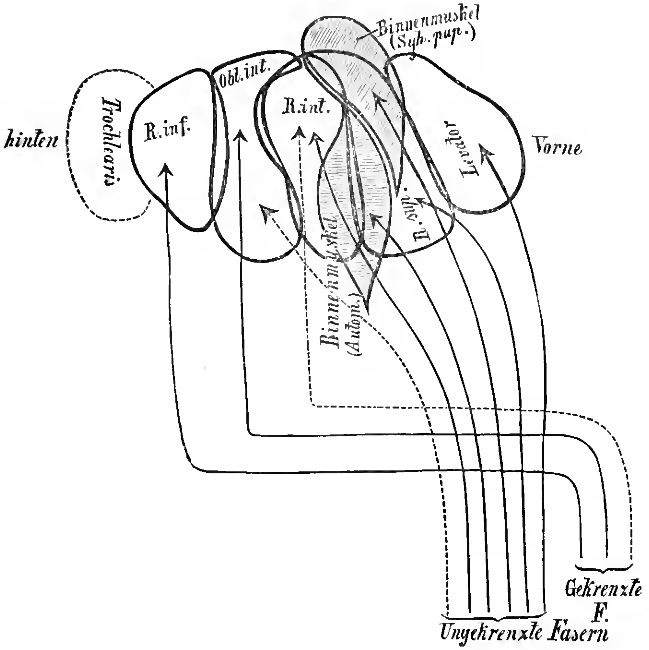


FIG. 1.—Schematic sagittal section through one principal lateral nucleus and adjacent nuclei. The shaded portions in this and the following figure represent the nuclei governing the sphincters of the pupils and the muscles of accommodation.

nucleus, and in the distal posterior fifth of the nucleus are restricted to the opposite side; in the next fifth are in both sides rather more in the opposite at first ; in the third and fourth fifths are only in the nucleus of the same side ; and in the most anterior fifth are in the most ventral portion of the nucleus of the same side.

The rest of the principal lateral nucleus, viz., the anterior and dorsal portions, as well as the paired small celled median nucleus and the large celled unpaired median nucleus, remain as centres for the levator palpebræ and the internal muscles.

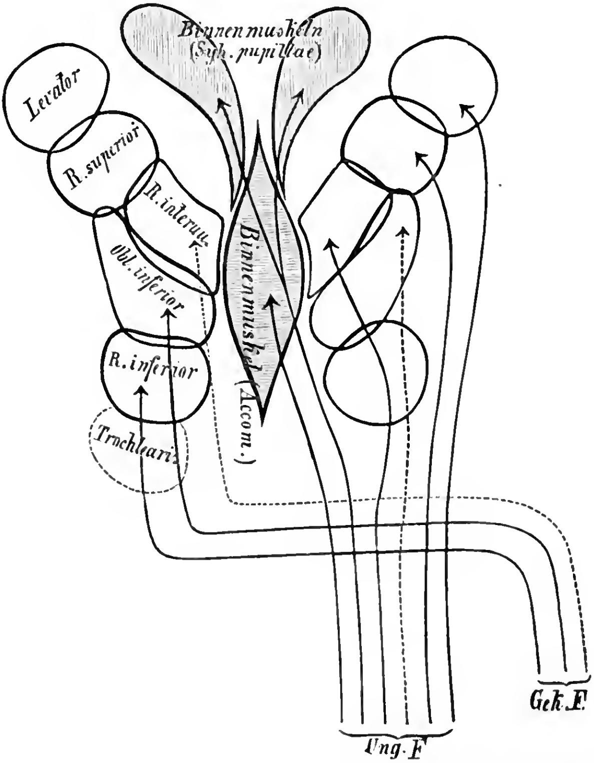


FIG. 2.—Schematic frontal projection of the two principal lateral nuclei and adjacent nuclei.

The small celled median nucleus of the right side belongs to the right eye. The large celled unpaired median nucleus belongs to both, but the cells for the right eye are more in its right portion and those for the left eye in its left.

From behind forwards, starting from the trochlearis nucleus the arrangement is as follows on the right side. First the centre for the (crossed) rectus inferior of the left eye, then that for the obliquus inferior (crossed) of the left eye. The latter group of cells is smaller dorsally and laterally than in its ventral and median part, and from the ventral part fibres seem to run to the obliquus inferior of the right eye.

Then follows the centre for the right rectus internus, from whose dorso-lateral portion fibres seem to run to the left (crossed) rectus internus. The medial ventral portion of this nucleus lies close to the unpaired large-celled median nucleus.

The nucleus for the rectus superior of the right eye follows. The remaining proximal portion of the principal lateral nucleus is the centre for the right levator palpebræ.

The paper is accompanied by diagrams explanatory of the author's views, two of which are here reproduced.

*(To be concluded in the following number.)*

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## OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

H. R. Swanzy, F.R.C.S.I, President, in the Chair.
Thursday, October 20, 1898.

*Glioma of the Optic Nerve.*—This paper was presented by Messrs. J. F. Bullar and C. Devereux Marshall. The case upon which it was based was that of a woman, aged 37 years, who noticed nothing wrong until 1889, when the left eye became more prominent than natural. It continued to become more and more pushed forward until 1895, when Mr. Bullar operated, and removed the tumour with the eyeball attached. Immediately behind the globe the optic nerve was of normal size for a distance of 15 mm.

It there formed a pear-shaped swelling 50 mm. long and 20 mm. wide. A cyst-like cavity was found inside this, which contained straw-coloured fluid. On opening it, the interior was found to be rough and vascular, and had a fatty appearance. The tumour was encapsuled. The optic nerve was completely lost as soon as it entered the tumour, and it was not again seen at the posterior part, as the growth extended at least as far as the optic foramen, and was cut across behind. The patient did quite well, and had since got married, and was in good health. The tumour was proved by microscopic examination to have originated in the neuroglia; the authors have therefore termed it a glioma of the nerve. The eye was normal. In the literature of the subject 130 cases of growths of the optic nerve were recorded, and the results of these showed that these tumours were of slow growth, but should be classed as malignant, as they were liable to extend into the brain, although metastases had not been found in any case. The question of growths of all sorts found in the optic nerve was discussed, and although the different terms applied to them were legion, yet the authors were strongly of opinion that the majority of them would fall into three groups: (1) Those originating in the neuroglia, which should be termed "gliomata"; (2) those originating in the dural sheath, "sarcomata"; and (3) those originating in the pial sheath, "endotheliomata." Mr. Bullar added that there had been no difficulty in removing the tumour. As soon as the conjunctival sac was opened the finger passed easily into the orbit, and the tumour was easily defined; it was not necessary to clear out the orbit. The posterior section of the growth was made as close to the apex of the orbit as possible, but the tumour was cut through, so that some portion of it must have been left behind. It would have been quite easy to remove the whole of it, leaving the eye behind; but in the stretched condition of all the parts he had not thought this advisable.

The President remarked on the rarity of tumours of the optic nerve. He only remembered seeing one case.

Mr. Treacher Collins commented on the great variety of names which had been given to this form of tumour. He thought the best classification was the anatomical one—those originating in the sheaths of the nerve and those starting in the nerve itself. The optic nerve was a prolongation of the brain substance, and gliomata of the optic nerve resembled those of the brain in structure rather than those of the retina.

*The Tension of the Eye in Irido-Cyclitis.*—This communication, which was presented by Captain H. Herbert, I.M.S., was based on observation of 144 eyes affected with irido-cyclitis. In the majority of attacks, more especially in the milder attacks, the tension was, as in simple hyperæmia of the iris and ciliary body, reduced; the reduction lasting, as far as the evidence went, at least as long as any ciliary injection remained. In other cases a period of high tension of very variable duration came on. The high tension appeared to be due to the blockage of the normal outlets from the anterior chamber, and the eyes chiefly affected were (1) those very severely attacked, with copious exudation, and (2) eyes perhaps slightly attacked but predisposed to glaucoma, as shown by shallow anterior chamber in the sound fellow eye and by the more or less advanced age of the patient. In these high tension cases the anterior chamber was deepened and the pupil slightly dilated. In the most intense inflammations the plus tension rapidly gave way to a softening, which might be permanent and which indicated atrophy of the ciliary body. The mild attacks, which were little removed from primary subacute glaucoma, were of interest because of difficulties in diagnosis and in treatment. There were no grounds for attributing high tension to cyclitis as distinguished from iritis.

Mr. Priestley Smith said that the principles enunciated by Captain Herbert were now generally accepted. There were two factors, mutally antagonistic, concerned in the disturbance of tension in irido-cyclitis: one was the suppression of secretion, reducing the tension; the other was

the formation of an albuminous exudation hindering filtration and raising the tension. In certain injection experiments made many years ago he had proved that a limpid serous fluid escaped from the anterior chamber very much more slowly than did a normal saline solution under the same pressure. Captain Herbert had gone further than previous observers in demonstrating that even slight degrees of iritis are associated with disturbances of the secretion process which are sufficient to modify the tension of the eye. He had been glad to hear in this paper of the value of the tonometer which he had introduced. His own experience was that, provided its necessary limitations were understood, it was a very useful instrument.

*Card Specimens.*—The following card specimens were shown: Mr. R. M. Gunn: Case of Retinal Disease. Mr. R. D. Batten: Superficial Central Choroiditis.

# NEURITIS OF PREGNANCY AS A CAUSE OF OPHTHALMOPLEGIA.

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In vol. xxv. of the *St. Thomas's Hospital Reports*, Dr. H. G. Turney published a very interesting and valuable article under the heading "Poly-neuritis in relation to Gestation and the Puerperium." This form of neuritis, he points out, it is important for both obstetricians and neurologists to recognise, if only to avoid the risk of attributing the symptoms, in spite of the patient's denials, to alcoholism. A case which has recently come under my care, and which I narrate below, makes me think it desirable to draw the attention of the ophthalmologist also to this interesting form of peripheral neuritis. As far as I can find, the notice of the ophthalmic surgeon has not yet been drawn to this disease, which may manifest some of its symptoms in his sphere.

In the more general picture of the disease, which I think it desirable here in outline to sketch, I am necessarily largely indebted to Dr. Turney's paper. This form of peripheral neuritis may occur either during the period of pregnancy, or after parturition, and in either case is the same condition, viz., a neuritis of toxæmic origin, the toxic products, as yet unisolated, being regarded as the result of the altered metabolism of the pregnant or puerperal period. To cases of

temporary paralysis due to pressure on sacral nerves during parturition, Dr. Turney would apply the name "obstetric neuritis," and this class of case, as well as that in which peripheral neuritis occurs in puerperal septicæmia, has to be carefully differentiated from those cases of toxic neuritis whose onset occurs during a normal pregnancy, or follows a perfectly easy and uncomplicated confinement. Among Dr. Turney's quoted cases is a group in which the affection is either limited to a single nerve or is asymmetrical; good reasons are given for holding that such asymmetry or selection is no argument against the exciting cause being a toxæmia, and Gowers is quoted in support of this statement.

In the history of the disease, since attention was first drawn to it by Möbius in 1887, as well as for its full description, I must refer the reader to Dr. Turney's paper. The following extract from this source will, however, convey a good idea of the symptoms that may be met with in any case, either all or any of them. "Of thirteen cases, six occurred during pregnancy, on an average from the fourth to the fifth month; the remaining seven at intervals varying from two days to a fortnight after delivery. Almost without exception the first symptom noticed is pain, oftentimes very severe and of lancinating character, extending down the limbs first to be affected. As a rule, the lower extremities are attacked first and most severely. The pain is, in the space of a few hours or days, followed by loss of muscular power, soon increasing to complete paralysis. Rapid wasting, with loss of reflexes, and more or less complete reaction of degeneration are noticed within the space of a week or two from the onset. Both muscles and nerves are tender, sometimes acutely so, but spontaneous pain after the first few days is often absent. . . . At the outset the sphincters are not uncommonly slightly affected, but

this symptom, even when present, is very transient. Sensation, apart from the almost invariable hyperæsthesia of skin and muscles, escapes as a rule much more lightly than the motor functions. Commonly the sensory defect does not amount to more than blunting of sensibility in the fingers and toes. In the severest forms, however, anæsthesia at the periphery of the limb may be complete. In no less than five cases out of thirteen the presence of dysphagia or tachycardia, or both, suggests implication of the vagus, while in two loss of voice points to lesion of the spinal accessory. In two cases the cranial nerves are affected. In six there are mental symptoms, the change ranging from emotionalism to acute mania; as a rule, however, there is nothing more than confusion and loss of memory. The ingravescent stage of the malady occupies from one to three weeks. In a minority, improvement seems to occur as soon as the symptoms have reached their maximum, recovery being thus complete in a few months; but more usually these hopeful signs are delayed, and the return to health is not accomplished till from one to two years. Even then, as in alcoholic paralysis, difficulties occur from shortening of tendons, which have to be overcome by surgical or other treatment. The clinical picture presented by these generalised cases is that of the severe forms of alcoholic paralysis, the salient feature in each being the special susceptibility of the posterior interosseous nerve in the arm, and the anterior tibial and peroneal in the leg, combined with evidence of irritation rather than of paralysis of sensory fibres."

This general picture of the disease Dr. Turney follows with a description of an upper limb type, a lower limb type, and a type in which a single nerve is affected. When I learnt that he was engaged in the consideration of this subject, I drew Dr. Turney's

attention to a case reported by Mr. Lawford Knaggs in the *Transactions of the Ophthalmological Society*, vol. xvi., under the heading "A Case of Reflex Amblyopia due to Pregnancy;" in the discussion which followed I am glad to notice considerable exception was taken to this title. Dr. Turney's comment upon this case is as follows: "Although this is reported as a case of reflex amblyopia, it appears to admit of a much simpler explanation—that it is a case of retro-bulbar neuritis of toxic origin. Partial atrophy as a result of reflex amblyopia is difficult to imagine, but as soon as the toxic element is recognised all improbability disappears. As we have already seen, when speaking of polyneuritis, the idea of reflex paralysis dies hard. Its sphere, it is true, becomes yearly more limited, but unfortuuately it has not yet been relegated to the limbo of medical superstitions."

Between thirty and forty authentic cases of this form of toxæmic neuritis are alluded to or recorded by Dr. Turney, and as a result it is found that "the cortical centres in the brain, the motor nuclei in the pons, the corresponding nuclei in the cord, the purely sensory tract of the optic nerves, the nerves of the medulla, and finally, those of the extremities—all in turn suffer from the effects of the poison."

In addition to Mr. Lawford Knaggs' case above alluded to, there appear to be two cases of generalised peripheral neuritis due to toxæmia of pregnancy or puerperium in which orbital nerves, among others, showed the effects of the altered blood condition. One is a case by Lunz (*Deutsche Med. Woch.*, 1894); diplopia due to weakness of both sixth nerves was a symptom; the case was a very general one, many cranial nerves as well as all the extremities being implicated; finally recovery was complete. The second is recorded by Handford (*British Medical Journal*, 1891, vol. ii., p. 1144); there was complete paralysis of both third

nerves; at least all the extra-ocular muscles supplied by these nerves, including the elevators of the lids, were paralysed, and iridoplegia was also noted; no mention of cycloplegia or the accommodative function is made. There was loss of power and sensation in all the limbs, but the diagnosis is not quite certain, and it may have been a mixed case of peripheral neuritis and spinal cord disease. At the end of three years the ophthalmoplegia and general symptoms were practically unchanged.

These cases I now desire to supplement by a brief description of one which has recently been under my care. Mrs. A. B. came to me privately on July 13, 1898, on account of aching of the eyes and enlargement of the right pupil. The aching of the eyes depended on myopic astigmatism, and has been quite overcome by the glasses prescribed for her. Her refraction and vision were as follows:—

$$\text{R.}\ \frac{-\ 2\cdot 5\ \text{D. sph.}}{-\ 1\cdot 5\ \text{D. cyl.}} = \tfrac{5}{5}. \qquad \text{L.}\ \frac{-\ 2\cdot 5\ \text{D. sph.}}{-\ 1\cdot 0\ \text{D. cyl.}} = \tfrac{5}{5}.$$
$$\diagdown 80^\circ \qquad\qquad\qquad 50^\circ \diagup$$

The history was that the right pupil became enlarged about ten weeks before the birth of her second child on December 8, 1897. During the two months preceding her confinement she had occasional sharp tingling pains down the legs, especially the right, and was unable to get about much; three weeks before her baby was born she had numbness and loss of sensation in the fingers of one hand for about five minutes, and on the same day for a few minutes had some difficulty in articulation and speech. There was occasional sickness during gestation, but not persistent or severe enough to require treatment or be seriously regarded as the essential vomiting of pregnancy. During the last two months of this pregnancy she was very weak, and her legs were so feeble she could hardly walk at all, and for a week in October could not sit up for longer

than five minutes at a time. Her confinement was normal, but left her emaciated and exhausted, and she did not recover her strength until she ceased nursing her baby after about two months. The child weighed 9 lbs. when born. During lactation she suffered from severe fifth-nerve neuralgia; the pain, she thought, started from a tooth, it involved the left side of the face and head and the left ear, and was very acute for one week.

On examination the left pupil measured 4 mm., and the right 6 mm. The movements of the left pupil were quite normal. The right pupil did not contract so perfectly as the left to direct light, but I thought the defect was less marked when the light stimulus was an indirect one. Both acted well with convergence, but the right never became so small as the left. The movements of the eyes were quite full; she had never had diplopia; there was no ptosis. The power of accommodation was equal in the two eyes and not impaired in either. The fundi and tension were normal.

The knee-jerks were normal. The movements of the tongue and palate, and the power of the masticatory muscles, were all full. There was no numbness anywhere complained of. Sensation over the skin area supplied by the various branches of the fifth cranial nerve was nowhere impaired.

On December 28, 1898, I hear that there is practically no diminution in the size of the right pupil since I saw Mrs. A. B. Her husband, who is in the profession, informs me, however, that he considers the reaction to light to be now normal on both sides, but that the right pupil fails to contract as briskly and fully as the left with the act of accommodation.

This case, I had no doubt, was one of partial iridoplegia due to toxæmic neuritis of pregnancy; we have seen that the motor nuclei as well as the nerve

trunks are often affected in this form of neuritis, as in that which follows diphtheria. I may say that having come to this diagnosis I detailed the case to Dr. Turney, and he took the same view. I have chosen to record it here as its main abiding symptom was a partial ophthalmoplegia interna, and I thought that if the attention of ophthalmologists were called to this not uncommon form of peripheral neuritis, we might find ourselves able to account for some cases of ophthalmoplegia interna or externa, for which at present we are at a loss to assign a cause. The number of cases of unexplained ophthalmoplegia is certainly large, and if it can only be slightly curtailed it will be a step forward. The same form of toxæmia moreover, it appears, may manifest itself in the shape of a retrobulbar neuritis, which makes it of still greater interest to the ophthalmologist.

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ALBERT MICHEL (Bordeaux). **A Bacteriological Study of Phlyctenular Ophthalmia.** (*Annales d'Oculistique, October*, 1898.)

In this paper Michel arrives at the following conclusions:—

(1) Phlyctenular ophthalmia is a parasitic affection; the essential cause is a microbe; the diathesis of the patient is only a predisposing cause.

(2) From the contents of phlyctens various microbes may be cultivated; the staphylococcus (albus or aureus) is the commonest.

(3) The inoculation of staphylococci and various other (but *not* all) microbes beneath the corneal epithelium produces lesions similar in appearance to the phlyctens found in man.

(4) The pathological anatomy of the experimental phlycten shows that in man the lesion ought not to be limited to the space immediately beneath the epithelium, but that it should be accompanied by an infiltration of the superficial layers of the cornea. This simple infiltration should form the phlycten in man as it does in animals.

(5) A phlycten appears to be a lesion of reaction of the organisation against microbes which invade the cornea.

Having gone fully into the literature of the subject, Michel describes his method of obtaining the contents of the phlycten by means of a carefully sterilised Pasteur pipette. Various media were used for the cultivation of these contents, and they were subjected to microscopical and staining examinations.

Out of eighteen observations he found the staphylococcus aureus ten times, and the staphylococcus albus seven times. Nine times (out of the ten) the staphylococcus aureus was found absolutely alone; in the tenth it was associated with a diplobacillus which Michel considers to be similar to that found by Morax in cases of subacute conjunctivitis. Michel found the staphylococcus albus alone in five out of the seven cases in which it occurred, while in the sixth it was accompanied by a short bacillus which was not identified. In the seventh it was associated with the sarcina lutea.

In only one of the eighteen observations was the staphylococcus absent, and in this the bacillus of Loeffler was found.

By a series of inoculation experiments on rabbits he found that the staphylococcus in four out of eight attempts caused phlyctens, ascribing his four failures to inefficiency of methods or to fractiousness of the patient. Various other kinds of microbes also caused phlyctens when inoculated, but substances such as essence of turpentine, saturated solution of cantharidin in acetic ether, vermilion, or carbonate of lime did not. On the other hand, some microbes (*e.g.* pneumococcus) did not cause phlyctens though inoculated under similar conditions.

On investigating the pathological anatomy of the experi-

mental phlycten, the superficial epithelium was found to be in a state resembling inflammation. Beneath this there was a mass of round and normal cells pushing back Bowman's membrane, behind which numerous leucocytes appeared growing less in number as the deeper layers of the cornea were reached. Hence the phlycten may be looked upon as a result of phagocytosis called out by the entrance of microbes beneath the superficial epithelium, or even into the superficial layers of the cornea itself.

A full bibliographical index is given.[1]

F. C. CRAWLEY.

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**A. PECHIN. Prophylaxis of Purulent Ophthalmia of the Newborn.** *Recueil d'Ophtalmologie, October,* 1898.

Péchin recommends ante-partum vaginal douching, followed by careful washing of the child's eyelids with warm, previously boiled water, and then free lavage of the conjunctival sacs with tepid distilled boiled water.

He considers that silver nitrate, even in a strength of 1 in 100 or 2 in 100 (Crédé), is liable to cause slight scarring of the cornea and consequent lessened acuity of vision, perhaps strabismus, and possibly conjunctivitis.

Protargol, in his opinion, is not yet proved to be superior to silver nitrate.

Though purulent ophthalmia at birth is placed in the list of epidemic diseases which must be notified by the medical attendant (June, 1893), Péchin considers, with Vallin, that midwives should be taught to immediately call in a doctor in every case of ophthalmia neonatorum, and not to trust to their own diagnosis of its benignity, for precious time may thus be lost.

F. C. CRAWLEY.

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[1] See also "Axenfeld," p. 335.

# ABSTRACT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETY, HEIDELBERG, 1897. *Wiesbaden, J. F. Bergmann.*

(*Concluded from page* 313.)

A. Bielschowsky (Leipzig). *Monocular Diplopia not depending on a Physical Cause.*—A man of 18 years of age had his good eye removed after an injury, and was left with the other (the left), which had always been amblyopic. He believed that he had squinted as a child, but for years the squint had not been noticed, and he had never observed any diplopia.

Three days after enucleation he noticed diplopia, and described the right image as the true and the left as the false. The left image lay somewhat lower than the right.

Three weeks later the case was examined, and the following are the principal features of it.

The false image appeared duller in colour than the true, but was sharper in outline. The distance of the double images increased with the distance of the object from the eye. By a slight movement of the eye to the left the man could, as he said, pass from fixation of the true to fixation of the false image. He did this when he wished to see distinctly. The diplopia existed only in a definite central region of the retina. In ophthalmoscopic examination the man saw two images of the lamp, and it could be determined that the true image fell on a spot to the inner side of the fovea.

In process of time the man paid more and more attention to the false image till he found it difficult to fix the true one for any length of time.

The diplopia, then, cannot have been caused by the presence of two images of the object on the retina; on the contrary, there was but one retinal image, but it was located simultaneously in two different positions in space.

The "projection-theory" of Nagel is quite incapable of explaining this monocular diplopia. It can only be explained on the "identity-theory" of Hering. It is pro-

bable that this man had binocular vision during his squinting life, and had been able to utilise the image received on his left eye for purposes of binocular vision. He was accustomed in the course of years to project this image in the direction of the visual line of his right eye, and had thus acquired a new relation in space for the visual line of the left eye.

So long as the right eye remained, this new relation overpowered the congenital or normal one, but after the loss of the right eye the congenital arrangement reasserted itself, and by degrees completely overcame the acquired. The man had, in fact, two centres of the left field of vision, and two visual fields, and the diplopia is to be explained by the conflict between the two fields of vision when the suppression of the congenital centre ceased after the loss of the right eye.

The rapid changes from fixing with the "pseudo-centrum" and fixing with the natural one caused the feeling of diplopia.

L. Weiss (Heidelberg). *The Visual Field in Strabismus.*—141 cases were examined, 25 with strabismus divergens, 12 with strabismus divergens artificiale, 104 with strabismus convergens.

Of the 25 strabismus divergens 1 had concentric contraction, 1 a nasal contraction, and 2 central scotoma.

Of the 12 strabismus divergens artificiale, 1 had nasal contraction, and 1 had a scotoma.

Of the 104 strabismus convergens 7 had concentric contraction, 7 nasal contraction, 3 temporal contraction, and 5 central scotoma.

From these figures it is manifest that defects in the field are not very uncommon in squinting eyes; but the observations do not lend any force to the arguments in favour of the theory of amblyopia exanopsia, for if it is sound there would be found a much more constant and pronounced defect in the nasal side of the field in cases of old convergent strabismus than Weiss has observed.

A. Darier (Paris). *Ptosis Operation by Autoplasty or Muscle Grafting.*—Darier's proceeding is essentially a modification

of that of Panas by the ingenious device of substituting a muscular connection for the skin flap by which Panas attaches the lid to the occipito-frontalis. An oval piece of skin is first excised along the whole length of the lid of 3 mm. in greatest breadth, leaving the fibres of the orbicularis intact beneath. Two flaps are then cut in this muscle, and an incision is made in the eyebrow parallel to that in the lid. The skin is dissected downward to join the two incisions, and the two muscle flaps are drawn up and sutured to the upper border of the incision in the brow, their other ends being finally sutured to the tarsus and the lower edge of the original incision in the eyelid.

Darier has done the operation once with excellent results and the patient was exhibited at the meeting.

Karl Baas (Freiburg in Br.). *The Anatomical Basis of Ring-scotoma and Syphilitic Eye Disease.*—The author gives the results of a microscopic examination of the eye of a girl who, after syphilitic choroiditis, exhibited a permanent ring-scotoma, and some years later died of phthisis, the ocular conditions remaining unaltered.

The observations confirm the current view that this defect, ring-scotoma, is due to a lesion of the choroidea, which affects the outermost retinal layers.

Microscopical examination of syphilitic eyes shows general sclerosis of the blood vessels with endo- and periarteritis of the arteries of the conjunctiva, and whole uveal tract. The retinal vessels are relatively much less affected, and the chief retinal changes are due to the choroidal lesions, and affect the outer layers.

A diffuse retinis may also be present, but if so, it is accompanied by a choroiditis, and is probably a more or less secondary trouble. The optic nerve, however, is usually inflamed in its intra-ocular portion, and Baas is inclined to attribute this common involvement of the nerve as distinguished from the retina to its additional blood supply from the ciliary vessels at the porus opticus.

In the discussion Leber stated that we must not attribute all ring-scotomata to lesions in the outer retinal

layers, for it must be possible to produce a ring-scotoma by a lesion in the optic nerve affecting the fibres which terminate in that region of the retina whose function is destroyed.

A. Vossius (Giessen). *Intermittent Exophthalmos.*—This rare affection has been described as exophthalmie à volonté, or exophthalmos and enophthalmos alternating. The cases from the older literature are recorded in Sattler's article in the Graefe-Saemisch Handbook, and the cause is, according to Sattler, a varicose enlargement of the orbital veins.

The eyes, normally, vary greatly in their prominence, and the two eyes are not always alike in this respect, and Donders has shown that changes are produced by respiration, forcible and prolonged expiration, coughing and sneezing causing exophthalmos, probably by venous congestion in the orbit.

Vossius has observed two cases, and has collected eighteen others from the newer literature. The exophthalmos was unilateral in all cases, the right and left eye being about equally often affected, and of the twenty cases fourteen were in men. The affection is more common in youth; one case appeared at birth, one at period of first menstruation, and one in pregnancy. Forced expiration and stooping forward bring on the exophthalmos, and the eye is often slightly abducted; there may be ptosis, and occasionally slight mydriasis. Compression of one or both jugulars brings on the attack. In a few cases varicose veins have existed elsewhere.

Vossius ascribes the affection to varicosities in the orbital veins, and believes the enophthalmos, which has been observed as a rather late phenomenon in many cases, is due to a secondary atrophy of the orbital fat, induced by the venous pressure and the occurrence of hæmorrhages.

O. Schirmer (Greifswald). *Function of the "Pararecticular," or "Amakrine" Cells in the Retina.*—These cells differ from all other retinal cells in having only centripetal

and never centrifugal processes. These processes communicate either directly with the nerve-fibre layer (according to one observer), or as most authorities state, with the ganglion cells.

As the result of his investigations upon the size and reaction of the pupil in diseases of the choroidea retina and opticus, Schirmer has come to the conclusion that these cells are connected with the action of the pupil. That there are special pupillary fibres in the optic nerve is extremely probable. If not we would expect to find sight and pupil reaction equally affected in diseases of the nerve, or if the pupillary function were a less important one than the visual we might find severe visual disturbance with slight pupillary defect. Neither supposition is correct. It is found, on the contrary, that the nature of the nerve lesion is all important, and that in all inflammatory lesions, acute or chronic, retro-bulbar or intra-ocular, the pupillary reflex is relatively more affected than in non-inflammatory atrophy, whether simple or due to compression, the visual defects being equal.

We should expect, also, that in the course of a disease visual defect and loss of pupillary reflex would increase and decrease concurrently. This is far from being the fact. After severe neuritis vision may be reduced to $\frac{1}{10}$ or $\frac{1}{30}$, and the pupillary reflex may be completely restored. In other cases the pupillary lesion comes on subsequently to the visual, and remains after it. Finally the pupillary reaction may be present in complete amaurosis from optic atrophy.

Schirmer's observations on the pupillary reflex in retinal disease show that it is commonly unaffected in the affections of the outer retinal layers, but is concomitantly implicated in the diseases which attack the whole retina or chiefly the nerve-fibre layer. In the former group he places pigmentary degeneration and detachment, the first of these being a result of sclerosis of choroidal vessels. In the latter group are included retinitis hæmorrhagica, embolism of central artery, and retinitis specifica. (Baas holds a different opinion on this last disease (*vide supra*).

The conclusion Schirmer draws from these observations is that the pupillary reflex must take its origin not in the rods and cones of the outermost layers, but in some of the inner layers of the retina, and it is very probable that the terminal organs of this reflex are the para-reticular cells. Their position is suitable, and no other function can be ascribed to them. It is only in accordance with modern physiology that special end organs should be attached to fibres fulfilling a special function.

A. Wagenmann (Jena). *Etiology of Arrested Retinal Circulation.*—It has been shown by Michel that thrombosis of the central vein plays an important part in the production of "hæmorrhagic retinitis," but it is evident that this lesion is not able to account for all the cases which exhibit the ophthalmoscopic appearances of hæmorrhagic retinitis, and similar appearances can be produced by multiple embolism, or by multiple thrombosis of several arteries.

Wagenmann describes the anatomy of a case of hæmorrhagic retinitis, the globe being removed two months after the attack. In the central artery there was endarteritis with contracted lumen, and near the lamina cribrosa a vascular enlargement. The smaller arteries and veins were often obliterated. The central vein was almost normal. It contained a partial thrombus. He explains the case by the theory that the arterial lesions were primary, and led directly to the secondary thrombosis of the smaller arteries and veins.

Cases of unilateral temporary blindness, which are followed occasionally by permanent blindness, are important in this connection. Wagenmann records one which he had the good fortune to examine during an attack. Perception of light and pupil reflex were abolished, and the arteries appeared as fine yellow lines, the veins as mere threads. In ten minutes the blood began to return to the arteries and then to the veins, and vision returned with the returning blood. This case is to be accounted for on the theory of vascular spasm, as described by Raynaud, and as in

Benson's case reported at the Edinburgh Congress. Similar appearances have been described in migraine. Wagenmann's patient finally had an attack which ended in total blindness with the ophthalmoscopic signs, embolism of central artery. But the author believes we must regard it as thrombosis of the artery, not embolus, which caused this termination. The case gives support to the theory advanced by Priestley Smith[1] and Galezowski[2] that thrombosis of the artery may produce permanent blindness in a patient suffering from recurrent attacks of temporary blindness due to arterial ischæmia.

In the discussion Haab stated that he would go further and class almost all the recorded cases of embolus as really thrombotic.

O. Haab (Zurich). *Choroiditis Sympathetica.*—The first description of this affection was given by Hirschberg in 1895, and a second case was published by Caspar the same year. Haab records four cases, the first dating back to 1892. The fundus in this case exhibited small whitish or yellowish round spots similar to the choroiditis disseminata seen in hereditary syphilis. Later on fine red lines on a brownish stippled ground appeared in the macular region.

The second case exhibited a macular lesion similar to that last described, but no disseminated choroiditis. However, the pupil could not be dilated, so choroidal lesions may have been present, though out of sight.

The third case had papillitis, and a pseudo-tumour in the retinal periphery, which rapidly disappeared. It exhibited small round spots of choroiditis disseminata.

The fourth case had these spots also along with well-marked neuro-retinitis. The six cases recorded show that the disease may appear in three forms: (1) Disseminated nodules; (2) Large yellowish-red ill-defined streaks concentric with the posterior pole (Caspar's case); (3) A peculiar stippling in the macular region.

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[1] Ophthalmic Review, 1884, pp. 1-33.
[2] *Ibid.*, 1881, p. 191.

Haab regards this affection, more especially the disseminated spots, which he locates in the choroidea, as giving support to the view that sympathetic inflammation is induced by some as yet unknown organised infective agent.

O. Haab (Zurich). *Intra-ocular Pseudo-tumour.*—The appearances were seen in the eye of a patient affected with a tumour of the upper jaw in the region of the lacrimal sac, and they exactly simulated choroidal sarcoma. The globe was unavoidably excised in the extensive operation required to remove the maxillary tumour, and it was then demonstrated that the apparent intra-ocular tumour was only a folding inwards of the eye tunics caused by the pressure of the external tumour in the orbit.

A second case occurred in the person of a man presenting a hard tumour on the inner wall of the orbit. In this case, too, the pseudo-tumour in the eye had a dirty reddish colour, and in one place had the appearance of normal choroid. This case, like the former one, was one of carcinoma of the superior maxilla, but the intra-ocular tumour was only a folding inwards of the wall of the globe. It was noted also that the disc was not circular, but oval, with the short axis at right angles to the border of the tumour.

Haab observed a third case caused by sarcoma of the superior maxilla, and here, too, the disc was oval, and it could be seen that the pigment epithelium of the retina had partly atrophied in the region pressed on by the extra-ocular tumour, so that the choroidal stroma was more visible there than elsewhere.

Cases of retinal detachment due to orbital tumours have been recorded before this, and Leber has accounted for the appearances by the explanation given by Haab.

It is well to know that a purely extra-ocular tumour may produce this pseudo-tumour in the interior of the eye, for it is quite possible for a surgeon to sacrifice an eye unnecessarily if he is ignorant of the harmless nature of the appearances. However, in the discussion, Wagenmann

stated that the infolding of the walls of globe in his experience only occurred with malignant tumours, so that these apparent intra-ocular tumours are clinically of less importance than might be supposed.

B. Stoelting (Hanover). *The Means by which Intra-ocular and Intra-cranial Pressure is Raised.*—The author endeavours, from the accepted theories as to the production and effects of increased intra-cranial pressure, to draw conclusions as to the production and effects of increased intra-ocular pressure. In the brain, as held by Bergmann, an increased pressure raises the pressure of the cerebral fluid till it equals that of the fluid in the capillaries, and stops the systolic dilatation of the latter, and thereby arrests the circulation and produces cerebral anæmia. Obstruction to the outflow of the cerebro-spinal fluid follows according to Bergmann, and the loss of the elasticity of the dura mater, which for a time compensates to some extent the rise, completes the process. Schultèn has shown that the intra-cranial pressure may exceed the blood pressure.

Experiments have shown that the escape of fluid injected into brain or eye-ball becomes in time more gradual, so that with the diminution of absorption the pressure acts more directly on the contents of the cranium or eyeball. A similar result, we may assume, is brought about by inflammation. The vascular walls become diseased, the lymph changes in character, the walls of the vessels gradually become weaker, the blood pressure, freed from the influence of the elasticity of the arterial coats, acts directly on the lymph and lymph vessels, which are already diseased and partially obstructed, and circulation finally stops.

We should expect, then, in glaucoma, to find two conditions, first an inflammation of the tunics, and then a blocking of the outlets for the intra-ocular fluid. Both these conditions are present according to the author, who finds choroiditis in almost every eye removed for glaucoma, and also the usual blocking of the angle of the anterior chamber.

TH. AXENFELD (Rostock) *Etiology of Phlyctenular Ophthalmia.*—Both internal and external conditions are of influence in the production of this disease, and first among the internal conditions, as will be admitted by all, is the strumous diathesis. It is difficult to ascertain in what proportion of cases this diathesis is present, as we are not yet agreed as to what constitutes the diathesis. No difference of opinion will be expressed in what we all recognise as a well marked case, but some, and among them apparently Axenfeld, consider the existence of phlyctenular ophthalmia sufficient in itself to establish the diagnosis of struma. This difference of opinion among authorities will account for the extreme discrepancy in the percentages given in various text books.

Axenfeld's cases amount to 200, and what he considers evidence of struma was present in more than 90 per cent. Although it cannot be allowed that the effect of the strumous diathesis is to be regarded as simply a vulnerability of the epidermis, still outer irritants have considerable influence in producing phlyctenular ophthalmia. Arlt enumerates the following:—(1) Acute or chronic dermatitis, as eczema of face and lids, acne, and blepharitis. To these may be added phthiriasis, and the exanthems. (2) Catarrhal conjunctivitis, or rather, its cause, as Arlt has shown that in strumous persons it often appears under the form of phlyctenular ophthalmia. (3) Injuries; but Axenfeld knows of no case so caused. (4) Overwork by artificial light, also unknown to the author. (5) Chronic irritation from dirt, &c.

The theory of an ectogenous infection has been strongly advocated by many authors, most of whom ascribe the disease to the staphylococcus and its allied pus-producing microbes. Axenfeld has examined one hundred cases with the object of testing the truth of this view, and his results are given later on. He observes first that several points have to be attended to in such an investigation. (1) The conjunctiva in these cases is usually so dirty that the discovery of a few staphylococci proves nothing. We must find them at least regularly at some certain stage of the

disease. (2) We must note if staphylococci are on the edges of the lids, and consider how far their presence in the phlyctenulæ is merely secondary. We know from dermatology how regularly burns, pemphigus bullæ, herpetic vesicles, and those of variola are infected with pus organisms, and that even before the bullæ have burst. (3) We must separate the cultures produced from the contents of the phlyctenula from those due to the conjunctival secretion. Most of the authors who have advocated the ectogenous view have not attended to these points, and their results are not in any case sufficiently constant; for instance, Bach finds only three positive inoculations out of ten fresh cases of phlyctenulæ. Why are the seven experiments fruitless? Inoculation experiments on animals are inconclusive. By scratching and rubbing, a purulent bleb, somewhat like a phlyctenula, can be produced on the conjunctiva, but when the cornea is infected what results is not a phlyctenula, but often enough hypopyon, a result which is clearly due to secondary infection. The conjunctival lesion, too, only resembles a phlyctenula in one stage of its existence, and never shows the really characteristic appearances of the disease. Bach and Burchardt call the affection an eczema, and point to the pus microbes as supporting their view; but as Axenfeld states, the dermatologists do not at all accept the view that eczema is one of the diseases caused by micrococci.

Axenfeld's own researches do not give any support to the views of Bach and Burchardt. In sixty-four cases of conjunctival phlyctenula cultivations produced a positive result only twenty-six times. (A positive result is counted when more than five cocci are found.) The above phlyctenulæ were not more than one day old.

Eleven phlyctenulæ of from one to two days old gave three positive results. Twenty-one older cases gave nine positive results. Six cases of unknown age gave three positive results. Fourteen cases of recent corneal infiltration gave only two positive results.

We must conclude from the above that phlyctenulæ are not as a rule caused by the presence of staphylococci.

Investigation of cases of "schwellungs-catarrh" leads to a similar conclusion, viz., that in it, too, the staphylococcus is not regularly present. The conjunctival secretion contained various micro-organisms in many of the cases even when the contents of the phlyctenula itself were free from such infection.

From the above it is evident that Axenfeld does not believe that any known microbe can be regarded as the cause of phlyctenular ophthalmia, and he is also of opinion that it is improbable that the disease is produced by any specific microbe. On the contrary, his view appears to be that any indefinite irritant can set up the disease in a suitable soil.[1]

F. v. Hippel (Heidelberg). *Hydrophthalmos Congenitus.*—This paper describes the appearances found in the eyes of a four-weeks'-old child who came under observation for keratitis parenchymatosa.

The corneæ were enlarged and ectatic, the anterior chambers distended and deepened, the pupillary borders ectropionised, the lenses small, and the papillæ excavated with laminæ cribrosæ bulging backwards.

On both sides there was a large ulcer of the posterior surface of the cornea. Descemet's membrane terminated abruptly at the edges, and the surface was covered by a granular deposit. Inflammatory changes were present in the corneæ and Bowman's membrane was thickened with epithelial infiltration. The angles of the anterior chambers were open, and inflammatory changes were present in the irides and ciliary bodies, but the lenses choroideæ, vitreous and retinæ were normal.

V. Hippel ascribes the hydrophthalmos to intra-uterine inflammation of the anterior portion of the eyeball, induced by some endogenous infection, which probably located itself primarily on the posterior surface of the corneæ. It may be objected to this view that we see buphthalmos with transparent cornea, but Hippel observes that we do not usually examine these cases carefully for

[1] See also Michel, p. 323.

opacities on the posterior surface of the cornea, and that we do not know to what extent intra-uterine lesions may disappear without leaving any traces behind them.

If the theory is sound, we must find in old buphthalmic eyes microscopical evidence of the former lesions in Descemet's membrane, as we know that it is never restored, but only replaced by a vitreous formation. Hippel has found this formation in two cases, and a defect of the membrane was present in seven cases of other observers out of nineteen which were microscopically examined. The theory of a choroidal origin for the condition has no sound evidence to support it. The atrophy of the choroidea so frequently found is a secondary lesion, as in the two fresh cases examined, Hippel's and one of Manz, the choroidea was perfectly normal.

H. Sattler (Leipzig). *Treatment of Congenital Dislocation of the Lens.*—The operations which have been performed for this lesion are principally iridectomy, next in order discission, and seldom extraction of the lens in its capsule. Sattler refers to the publications of von Graefe and others on this subject, and then gives the results of his own operations by discission on three individuals and by iridectomy on a fourth. All the cases turned out satisfactorily.

In the discussion Everbusch stated that the best operation in these cases is a very small optical iridectomy, but that if anything more is needed discission should be performed. In one case he made a successful extraction by the method described by Knapp for removing lenses dislocated into the vitreous.

Th. Leber (Heidelberg). *The Occurrence of Phthisis Bulbi in Cases of Intra-ocular Tumours.*—It is known that tumours may grow in eyes already phthisical from former disease or injury, but the point touched upon by Leber in his interesting paper is to account for the fact that occasionally eyes which are the seat of a tumour become phthisical and the tumour itself ceases to grow for a time. These are not eyes where the tumour has per-

forated the globe and then proliferated so luxuriantly externally as to compress the globe and the primary growth within it, nor the cases where ulcerative keratitis leads to destruction of the eye in the usual way, but cases where an internal inflammation results in phthisis, and a temporary cessation in the growth of the tumour.

The cause which has been found by Leber to account for this occurrence is a necrosis of the tumour itself, which leads to inflammation in the neighbouring tissues. It is not merely a death of the cells of the tumour, but a necrosis of whole lobes or nodules of the growth, and it is not surprising that this should be followed by severe inflammatory reaction in adjoining tissues. Leber does not attempt to decide whether this necrosis is induced by mechanical causes or by infective micro-organisms.

TH. LEBER (Heidelberg). *Treatment of Gonorrhœal Conjunctivitis by Kalt's Douches of Permanganate of Potash.*—Kalt recommended frequent washing out of the conjunctival sac with weak solution of permanganate of potash for ophthalmia neonatorum, and Leber has tried the method also in the much more dangerous gonorrhœal ophthalmia of adults with good results. In ophthalmia neonatorum he finds it inferior to the ordinary method he has hitherto employed of weak applications of nitrate of silver (2 to 3 per cent.), combined with douches of weak sublimate solution and cold. He is so pleased with the treatment in gonorrhœal ophthalmia that he recommends its employment, although he has had experience of the remedy in only two cases. It has the advantage over the nitrate of silver treatment of being applicable at any stage of the disease. In babies he uses silver nitrate from the very beginning, not waiting, as others do, till the conjunctiva has developed a certain amount of swelling. He finds the permanganate painless, the solution being made with $\frac{3}{4}$ per cent. sodium chloride, and being somewhat weaker than recommended by Kalt, viz., 10 cb. cm. of 1 per cent. solution of permanganate in 1 litre of $\frac{3}{4}$ per cent. salt solution. The douching is applied three or four times a day. Others have recommended stronger solutions to be applied

twice daily, or still weaker solutions every half or quarter-hour; but Leber expresses himself well satisfied with the remedy as applied in the manner described above.

TH. LEBER (Heidelberg). *A Collection of Fat in Upper Part of Anterior Chamber.*—The collection occurred in the anterior chamber of a woman, aged 82, suffering from kidney disease. There was seen an orange-yellow mass in both the upper and lower regions of the chamber. The lower collection was $2\frac{1}{2}$ mm. high with a slightly convex upper border, the upper about the same dimension, with a more horizontal lower border. Below the upper collection was another smaller mass, and the posterior surface of the cornea was covered with numerous dots of the same orange-yellow colour. The eye was absolutely blind and stony hard.

Leber attributes the deposit in the lower part of the chamber to a former blood extravasation, the colour being due to blood pigment, but that in the upper part having a less specific gravity, most probably consisted of fat. This was partly corroborated by slight movements of the deposit towards the highest locality when the patient bent her head to one side or the other. A complete change in position of the deposit could not be obtained, but the smaller mass just below the upper deposit moved freely from side to side in accordance with the position of the patient's head. The lower mass did not move at all. Its upper border was very irregular, while the lower border of the fatty mass was the reverse.

TH. LEBER (Heidelberg) *Development of thread-fungus in the Vitreous after a Perforating Wound.*—The fungous growths were found in an eyeball with commencing phthisis after a wound from a knife. In the thickened vitreous there was a large collection of the mycelium of some fungus whose identity could not be determined, as the spores were destroyed by long immersion in 10 per cent. formol solution. Leber states it cannot have been aspergillus fumigatus, as there was no suppuration in the globe, and the aspect of the fungus differed from that of aspergillus fumigatus.

# OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

F. Richardson Cross, F.R.C.S., Vice-President, in the Chair.

Thursday, November 10, 1898.

*Accommodation Theories of Helmholtz and Tscherning: Suggested Explanation of their Discrepancy.*—Mr. Priestley Smith said that Tscherning's theory was sharply opposed to the generally accepted explanation, but was based on very accurate observations. The question was, whether the accommodative change in the lens depended on slack-

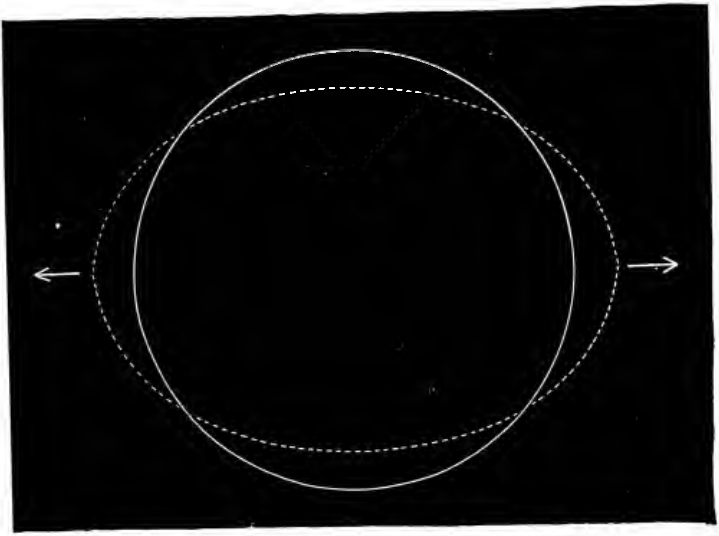

Fig. 1.

ening of the zonula (Helmholtz) or on tightening (Tscherning). The anatomical arrangement of the parts concerned and nearly all clinical and experimental facts, especially the observations of Hess, which showed that during strong accommodation the lens was often tremulous and displaced downwards by gravity, strongly favoured the former view.

Tscherning, however, had proved that during accommodation the anterior lens surface changed from a globular to a hyperboloid curve—that is, tended to become conical—sharper at the centre of the pupil, flatter towards the margin; and this, he contended, could only be caused by tightening of the zonula supplemented by internal resistance at the pole of the lens. The author's object was to show that this change could be equally well explained by slackening of the zonula. Let the case of an elastic

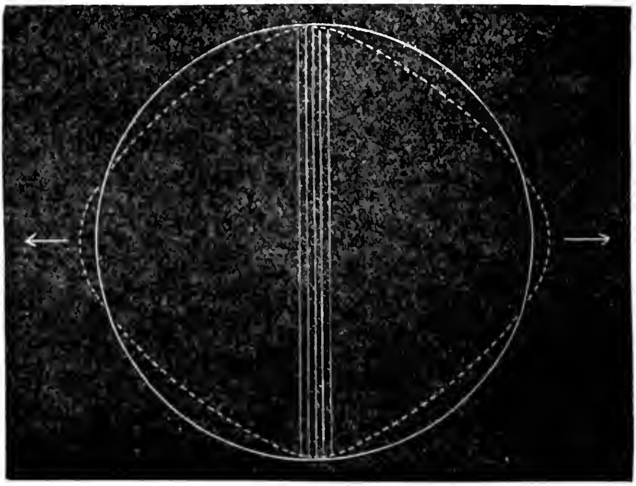

FIG. 2.

circular hoop of steel first be taken. Traction at the sides transformed it into an elipse; the curve flattened at the poles and sharpened at the equator, and somewhere intermediate between these regions was a point where no change took place (fig. 1). The position of this point and the general contour assumed by the hoop were governed by the varying resistance which it offered at different points. By modifying the resistance the curve could be modified at pleasure. Let the resistance at the pole be increased (fig. 2) and the conical form observed by Tscherning was obtained; let it be increased towards the

equator (fig. 3), and the opposite effect, namely, a flattening at the pole and a sharpening of the curve elsewhere, was obtained. The speaker exhibited a model consisting of an elastic hoop of metal bent so that it assumed, in exaggerated form, the shape of the lens during accommodation, namely, conicity of the anterior surface (fig. 4). It was strengthened with supplementary elastic strips in such a way that its resistance or rigidity increased

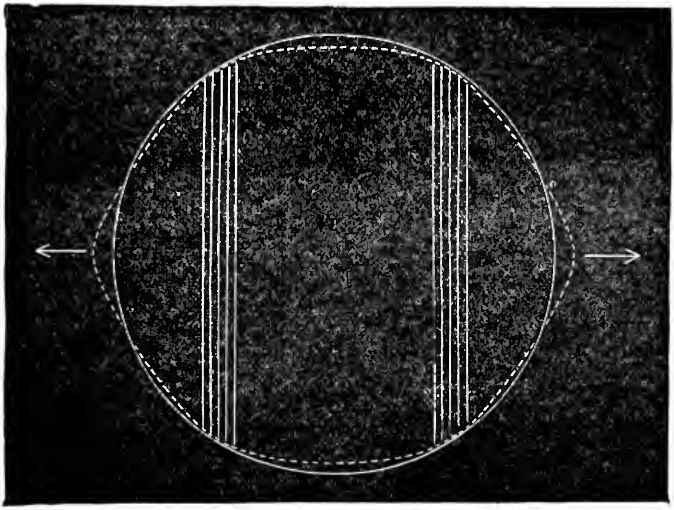

Fig. 3.

progressively from the pole towards the equator. Traction at the equator, representing tightening of the zonula, reduced the conical to a spherical form. In the latter condition it represented the lens when subjected to the influence of the zonula; in the conical state it represented the accommodative change which occurred when the zonula was slackened by contraction of the ciliary muscle. It would be easy to theorise as to the resistance proper to the crystalline lens, and to show reason for supposing that the arrangement of the fibres was such as to render the resistance progressively greater towards the equator, but

Mr. Priestley Smith said he would not go beyond demonstrable facts. What he desired to show was that the changes which Tscherning had demonstrated with such admirable skill and ingenuity were not incompatible with

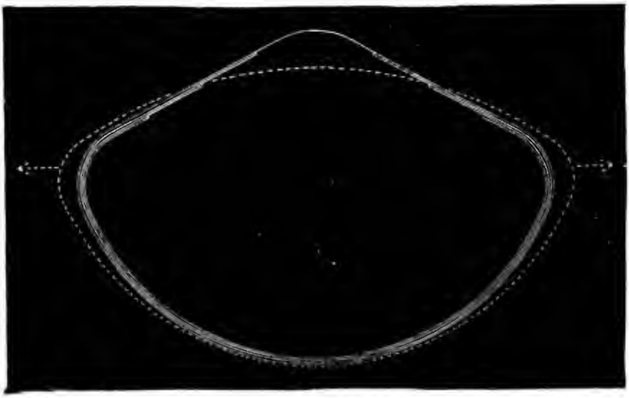

Fig. 4.

the theory of Helmholtz. To his mind they were explained more satisfactorily by this theory than by any other.

Messrs. Cross, Lang, Ernest Clarke, Bass, Doyne and Hartridge made remarks.

*Myxo-Fibroma of the Optic Nerve Sheath.*—Mr. Arnold Lawson reported a case. The patient was a well-nourished girl, aged 2. The sight of the left eye had been thought defective three months; it had been getting prominent a few weeks. The personal health and family history were both good; the left eye was slightly prominent, but its movements were good, and the pupil acted to light; the fundus was normal, except that the veins were rather full. Five weeks later there was decided proptosis, the pupil was inactive, the optic nerve pale, and the eye was blind; the movements, however, were good. From this time the symptoms progressed rapidly till the time of operation, five months after the first visit; the disc was then chalky

white, the eye was proptosed forwards and slightly downwards, and the movements were strictly limited. The eye and contents of the orbit were removed; the tumour, which was as large as a partridge's egg, nearly filled the orbit, and completely surrounded the optic nerve from the lamina cribrosa to the optic foramen. The child was now, six months after operation, in good health. The optic nerve was not involved in the tumour, which arose from the outer dural sheath. Microscopically the growth was found to be a myxo-fibroma. Mr. Lawson thought it inadvisable to attempt to save the eye in these cases; if the growth extended to the optic foramen, this latter should be scraped out. Myxo-fibromata were very rare; as a possible origin he suggested that a portion of the mesoderm intended to form the vitreous became included in the sheath of the optic nerve during its closure.

*Toxic Amblyopia due to Lead.*—Dr. Herbert H. Folker (Stoke-on-Trent) reported five cases which occurred among employées in the pottery district:—(1) F., aged 26, had worked in the dipping house two years; on four occasions she had had symptoms of lead poisoning, colic, vomiting, and headache. Vision failed in the left eye, and four days later in the right; the failure began with flashes of light and coloured vision, and rapidly proceeded to total blindness. The pupils were dilated and inactive, the optic discs pale and blurred, the retina œdematous, and there were several hæmorrhages in it. There was some albumen in the urine. (2) F., aged 20. Six weeks after beginning work as a lithographer she had headache and colic; after a year she had sudden total loss of colour vision, followed by sensations of light flashes. There was typical neuroretinitis, with hæmorrhages. In this case vision improved. (3) M., aged 16. Employed in the dipping house. After two years he had diplopia with headache, colic, and vomiting; the vision failed shortly after, and in six weeks he was totally blind. He also had coloured vision for a time and flashes of light. The optic discs were very white and the arteries reduced to white cords. He had a trace of albumen and a gum line. (4) F., aged 18. Employed in

the dipping house. After three years she had headache and vomiting; the vision failed in one night; she had flashes of light of various colours. The optic discs were intensely white. (5) F., aged 18. Employed in the dipping house. For ten months she had several attacks of headache, colic, and vomiting; then the sight failed, and in two months she was blind. The optic discs were white and the vessels small. In this series of cases all other toxic agents were excluded. All the patients who had worked in the dipping houses did not respond to treatment, the other single case did; in the former the poison was introduced by absorption through the skin, in the latter by inhalation. With one exception all the cases experienced coloured vision. Treatment was by iodide of potassium, or strychnine by the mouth or hypodermically.

*Card Specimens.*—Major M. T. Yarr, R.A.M.C.: Case with Fundus Changes and Fibrous Tissue Formation in Vitreous, (?) Congenital.

Mr. Treacher Collins: Case of Monilethrix affecting Eyelashes and Eyebrows.

Mr. Doyne: Case of Pigmentation of the Conjunctiva.

# ARTIFICIAL EYE-BALLS.


By H. Snellen, M.D.

Professor of Ophthalmology in the University of Utrecht.


The original prothesis, or artificial eye, was meant to cover an atrophic bulb. It was made, firstly, of enamelled metal, and was thin and shell-shaped, in order that it might fit into the narrow space between the eyeball and the lids. The enamel proved undurable and was replaced by china and afterwards by glass, but the shell-shaped form remained even after the operation of enucleation became more freely and variously applied. This operation belongs to a relatively late period. It was performed in 1841 by J. M. Ferrall in Dublin, and by Bonnet in France. Modern ophthalmology soon found many indications for it. Not only tumours and the fear of sympathetic inflammation, but the presence of chalky deposits in atrophic eyes, and cosmetic considerations, where the globe was enlarged, deformed or painful, led to the employment of simple enucleation of the eye.

The shell-shaped prothesis, though suitable where an atrophied eye remains, does not answer its purpose well after enucleation. The inside of the shell affords a space in which tears and mucus accumulate, and the thin edges are apt to wound the conjunctival sac, causing scars and subsequently granulation tumours.

With the view of increasing the mobility of the prothesis, and also to do away with the cavity behind the shell, various modifications of the operation have




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been proposed. Mulder, of Gronigen (Holland) performed evisceration of the globe in animals, and showed its possibility on the dead subject. A. Graefe, of Halle, introduced it clinically. In England, evisceration was combined with the introduction of a glass globe into the scleral cavity by Mules, and a similar glass globe was introduced into the hollow of Tenon's capsule by Adams-Frost.

The disadvantages of the eye-shells, where simple enucleation had been performed, led me to consider the question whether a different shape of prothesis

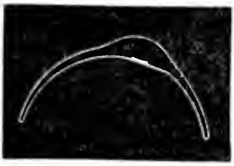

FIG. 1.

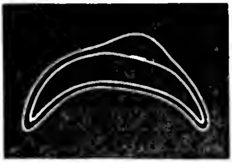

FIG. 2.

FIG. 3.

would not prove to be an improvement in these cases. In the first instance, I experimented by filling up the ordinary hollow artificial eyes with plaster of Paris or with the gutta-percha preparation used in dentistry and known as Gilbert's temporary stopping. The first trial was a decided success. Notwithstanding its greater weight, the filled-in eye-shell was preferred by the patient. The removal of the sharp edges and of the cavity proved to be a great advantage. The back of the prothesis was made either convex or concave,

according to the shape of the muscular stump upon which it rested.

Through the well-known ability of Messrs. Müller, of Wiesbaden, I was speedily enabled to have these filled-in shells copied and replaced by hollow glass globes, and after some further experiments, we came to the conclusion that three kinds of prothesis are required for different classes of cases, viz. (1) The original hollow artificial eye, or eye-shell, for cases of atrophic eyeball and after Mules's operation; (2) a double-walled shell for cases where a smaller stump remains, as after a simple evisceration; and (3) an artificial eye-globe, where the conjunctival sac is emptied and spacious.

It appears probable that the new forms of prothesis will help to enable us to retain the operation of simple enucleation, which, both for patient and surgeon, has certainly the great advantages of simplicity and convenience.

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WINTERSTEINER (Vienna). **Cavernous Lymph-angioma of the Orbit.** *Arch. f. Ophthal., Bd. xlv., Abth.* 3, *June*, 1898.

Cavernous lymphangioma in any situation is a rare form of tumour, and its occurrence in the orbit is seldom mentioned by writers on pathology. The case now reported by Wintersteiner is only the fourth instance to be found in medical literature, and even if allowance be made for unreported or unrecognised cases, it is evident that orbital lymphangioma of the cavernous variety is very uncommon.

The three previous cases were described by Foerster, Wiesner and Ayres (*see* OPHTH. REVIEW, 1896, p. 119). Wintersteiner's case differs from these in several parti-

culars, perhaps the most noteworthy of which is that the diagnosis of the nature of the growth was correctly made before operation. The differential diagnosis in these cases is generally between cavernous angioma of the ordinary kind, and cavernous tumour of the lymphatic variety, but in at least one of the previously reported cases the growth was thought to be a sarcoma.

Wintersteiner's patient was a weakly boy, aged 12 years, brought to hospital in February, in consequence of protrusion of his left eye. The father stated that the eye had been unduly prominent since birth, and that although the degree of proptosis varied considerably, it had slowly increased. The boy had never complained of pain.

On examination, the following conditions were noted: Right eye, nothing abnormal except corneal nebulæ, following ulceration. Eyelids healthy. Left eye, corneal opacity, preventing a careful examination of the fundus; vision reduced to counting fingers. The eyelids, both upper and lower, were hypertrophied, and showed an increase in length, breadth and thickness; in the upper lid the normal furrow in the skin was obliterated and the skin arched forward over the thickened, almost hemispherical lid. The eyeball, which was of normal size, was much protruded, the displacement being directly forwards; the cornea was, however, covered in almost its whole extent by the upper lid. Along the free margin of the upper lid were several small clear serous cysts. The palpebral conjunctiva was generally thickened and hyperæmic; in the middle third of the upper tarsal part was a tumour "the size of a bean," situated in and beneath the conjunctiva; it resembled a cluster of vesicles, and was very sparsely vascular. It was fairly sharply defined from the surrounding tissues, except upwards, where its edge could not be seen or felt. The ocular conjunctiva corresponding to the situation of this growth was much thickened and œdematous, and contained numerous small serous cysts.

The movements of the eyeball, notwithstanding the marked proptosis, were free, and apparently of full extent in all directions. There was no diplopia.

The exophthalmos could be very slightly reduced by pressure on the globe, and no pain was thus caused. No pulsation could be felt, and no bruit detected by auscultation. There was no appreciable increase in the proptosis on stooping.

By palpation through the upper lid, a softish yielding mass with an uneven surface could be detected in the orbit; it extended from the nasal wall outwards to the eyeball; to the temporal side of the globe an ill-defined resistance to the finger could be made out.

The features which led the author to decide in favour of cavernous lymphangioma, as against cavernous hæmangioma, were especially the cysts on the lid margins and in the ocular conjunctiva and the semi-translucent grape-like growth visible through the upper palpebral conjunctiva.

The entire contents of the orbit were removed; very profuse hæmorrhage occurred; the subsequent progress of the case was satisfactory and the boy was discharged two months after the operation.

Examination of the specimen, after hardening, showed that the growth was chiefly contained in the funnel between the recti muscles, which were widely separated by it. One lobulated outgrowth from the main tumour, about the shape, and twice the size of the lacrymal gland, had protruded between the superior and internal rectus muscles. In the axis of the tumour was the (macroscopically) unaltered optic nerve.

On transverse section, the cut surface of the growth had a lobate structure with well defined broad connective tissue boundaries. Each lobe was divided into irregular spaces by numerous ramifying septa; the spaces varied in size, the largest being about as large as a hempseed; the smallest, like pin points.

Microscopic examination confirmed the clinical diagnosis; the author describes the histological appearances in detail and illustrates them by two drawings. The blood-vessels of the orbit were found considerably altered; many of the large and small arterial branches showed an advanced condition of obliterative endarteritis; but at no

point were they completely blocked. In the vicinity of some of the degenerate vessels there were large extravasations in the fibrous septa. The veins in the neighbourhood of the superior rectus were noticeably dilated.

The remainder of the article is devoted to a comparison of the writer's case with those previously described, and discussion of some of the points of especial interest in such cases.

J. B. L.

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A. ANTONELLI. Mechanism of Strabismus in Hereditary Syphilitic Patients. *Archives d'Ophtalmologie, October*, 1898.

It is an incontestable clinical fact, says Antonelli, that strabismus is to be noticed frequently among patients with hereditary syphilis, and that it occurs certainly as a distinct direct result of their taint. Thus among ninety such persons under his own care, the author observed thirty in whom binocular vision was not present, they having a manifest squint if young, or, if older, having at least amblyopia of one eye, whether a squint was actually present or not. Taking these cases and others into consideration, Antonelli concludes that among hereditary syphilitics not fewer than 50 per cent. squint. The syphilitic taint, more clearly differentiated than any other hereditary dystrophy, is capable of exercising an influence upon the visual machinery by acting, as we shall see presently, upon either the sensory, the motor, or the retinal reflex apparatus of convergence. It is quite possible, for example, that the dystrophy may damage the sensory agreement between the two retinæ—the cerebral concomitance of the two visual impressions which are required to provoke the convergence-reflex; this would be a condition analogous to those delays of speech and

of intelligence observed in those who suffer from this hereditary disease.

Again, it may produce a disturbance of the innervation of convergence analogous to the disturbance of co-ordinated reflex mobility which is so frequent a cause of that delay in walking which one sees in children. But besides these pathological conditions of the sensory and motor divisions of the apparatus of binocular vision, and of greater importance than either of them, there are to be reckoned as a cause of syphilitic squint the damages, or "stigmata" which the congenital taint inflicts upon the eye itself and upon its appendages. Putting aside as well-recognised causes of strabismus the classical lesions such as keratitis, juvenile cataract, uveitis and grave affections of the retina and choroid, there remain such conditions as facial asymmetry, anisometropia, astigmatism and differences in the visual acuity of the two eyes, which he considers to be due also in a large number of cases to hereditary syphilis, and thus to be productive of squint. To take, first, asymmetry of head and face: this is apt to be associated with two chief conditions interfering with binocular vision, viz., alterations of visual function and disorders of mobility; in fact, one can often make out in these dystrophic "squinters" a certain degree of flattening of the forehead and face on the side of the deviating eye—a state of affairs almost always associated with abnormality of the ocular envelope also. The eye of the same side, often more sunk into the orbit than its fellow, is the victim of astigmatism, very probably compound hypermetropic in type, and possesses only imperfect vision. Were the sight of that eye good, were fusion easy, an effort to overcome these defects might be made, but with indifferent vision, anisometropia, &c., present, squint is well-nigh inevitable. But besides those cases in which, as has just been indicated, ocular lesions, properly so called, especially astigmatism and ophthalmoscopic alterations, are responsible for the development of squint, another factor in certain other cases must be taken into consideration, the influence, namely, of a co-ordinating nervous centre. There are, as a matter of fact, cases

in which vision of each eye being good, minimal ametropia and abundant accommodation being present, we are forced to the conclusion that the strabismus is cerebral in origin. This state of affairs is, as already hinted, analogous to the stuttering and stammering which may be present in patients whose whole peripheral vocal apparatus is in an unimpeachable condition. As to the cure which one is sometimes able to effect in squints of this class by stereoscopic and other exercises, as advocated by Javal and others, this proves that the cerebral lesions are for the most part to be regarded as functional, and that while these exercises obviously cannot reproduce in the centres their normal condition, they may assist in setting up anew the proper sensory motor co-ordination, and in thus establishing binocular vision.

Another cause of the frequency of strabismus in hereditary syphilitics is to be looked for in the circumstances which in such persons are apt to interfere with accommodation, for paresis of accommodation is one of the most fertile causes of convergent strabismus; this brings strabismus into relation with troubles of motor innervation, and into analogy with the delay of walking in young children.

The question, why do these imperfections of the eye proper so easily damage or prevent binocular vision, and yet leave simultaneous vision intact, is answered by saying that the former is the more highly specialised, the more complex function, more difficult and more tardy of establishment in the growing child, and, therefore, the more readily upset and interfered with. Simultaneous vision is more innate, a lower, a more "animal" function, and resists disturbing influences more effectually. Further, simultaneous vision is a function pertaining to peripheral rather than to central vision, and related, therefore, to the peripheral rather than to the central regions of the fundus; and syphilitic stigmata of the fundus, whether manifest or rudimentary, tend rather to spare the periphery and attack the centre—the region of binocular vision.

Should a lesion of the macular bundle, or of the whole

nerve, or of the retina or choroid in the macular area be present, so that the macular image does not ensure accurate central vision, and the retinal convergence reflex thus does not arise, all that then occurs is a retinal direction reflex, a condition of simultaneous vision with more or less development of strabismus. In such a case, if the difference in visual power between the two eyes is not too great, central vision will be alternate. For the establishment of the retinal convergence reflex, excitation of the two maculæ must be not merely simultaneous but sufficient, and at least approximately of equal value. If, on account of stigmata of the fundus, such as have been already spoken of, these conditions are not fulfilled, the innate direction reflex is likely to remain the sole response of the retina, and the convergence reflex, which is an art acquired after birth, is never "learnt."

To sum up the whole matter, Antonelli adopts these conclusions :—

(1) Strabismus in a considerable number of cases has its causes of origin in certain hereditary conditions of infective or toxic character, chief among which is syphilis. It is certain that many a child squints solely because his parents have suffered from syphilis, and among young patients affected with hereditary syphilis a very considerable proportion (*une bonne moitié*) squint.

(2) This congenital taint may bring about strabismus in a variety of different ways—(*a*) by lesions of the *sensory* portion of the apparatus of binocular vision preventing the simultaneous excitation of the cerebrum by the two retinal images, even when the visual acuity of each eye is fairly good and the two are approximately equal; (*b*) by lesions of the *motor* portion of the same apparatus, or of the connecting links between the sensory and the motor—thus the convergence reflex is not excited; and (*c*) manifest lesions of the *ocular* apparatus properly so-called, especially—besides the grave lesions of the transparent media and the retina and choroid—astigmatism and rudimentary alterations of the fundus. These lesions render the macular picture either itself imperfect (astigmatism or

opacity of the media) or imperfectly perceived (alteration of optic nerve, retina, or choroid); there is thus a lack of the necessary acuity and equality of the two macular images, conditions which are requisite for the convergence reflex, and the worse eye deviates.

It may be true that a considerable number of the patients affected with hereditary syphilis have defective fixation of one or of both eyes, but it does not appear to us that there is sufficient justification for the assertion that there is any distinct causative relation between syphilis and squint proper; to prove this one would require to prove that syphilis in children, to all appearance perfectly sound and healthy, produced hypermetropia and astigmatism, amblyopia of one eye with a normal fundus, an abnormal relation between accommodation and convergence, and a number of other conditions which, so far as we know at present, have not the remotest relation to hereditary disease. To say that hereditary syphilis may produce imperfect development of one side of the head, with a sunken globe, defective vision and astigmatism is simple enough, but to prove that one out of ten, twenty, or fifty of our strabismus patients is syphilitic, and that this syphilis has been the cause of the squint, is what M. Antonelli will find it very difficult to do. When a patient has had a fairly severe attack of interstitial keratitis he may be left with some astigmatism, in consequence of which he may squint; but we venture to say that no surgeon looking up the history of his squint cases will find that more than a most trifling number have had such a history, or any history even faintly related to it. We question very much whether Antonelli can succeed in proving any relation between syphilis and anisometropia, and we are quite positive on the other hand that the proportion of our hereditary syphilitic patients who acquire squint does not approach that stated by the author.

W. G. S.

**Jeanselme and Morax.** Ocular Manifestations of Leprosy. *Annales d'Oculistique, December,* 1898.

This article is founded first on eleven cases observed by the authors, of which notes are given, and secondly on the previous literature of the subject. Its conclusions may be thus summarised:—

(1) Ocular manifestations are extremely common in leprosy. The upper lids rarely escape when the skin of other parts is affected, and lesions of the globe itself are so common that in only four out of fifteen cases observed by the authors were they absent, and in these four the disease was comparatively recent (less than two-and-a-half years).

(2) The palpebral lesions do not differ from cutaneous lesions elsewhere. Leprous maculæ or tubercles may disappear without leaving a trace, or they may be followed by atrophic lesions of the skin or loss of hair; ulceration is rare.

(3) Conjunctival lesions are rare and *always* secondary to subjacent scleral lesions. Hence it cannot be the fact, as has been supposed, that infection of the deeper parts takes place from without.

(4) The seat of election for primary lesions of the eye is the anterior segment of the sclerotic which extends from the insertion of the recti muscles to the cornea, together with the corresponding episcleral tissue. These lesions, so long as they are confined to this region, produce only slight symptoms.

(5) Two types of corneal lesion occur, the one simulating a circumscribed tumour which has been mistaken for a leucosarcoma even under the microscope—the other and commoner type bearing a strong resemblance to ordinary interstitial keratitis.

(6) Infection of the iris may give rise either to a plastic iritis with nothing distinctive about it, or to a large "leproma" at the attached margin resembling certain gummatous and tubercular lesions found in the same region, or lastly, as in two cases observed by the authors,

to small grey dots on the anterior surface of the iris, requiring to be seen with a magnifying lens and resembling the leprous nodules in the cornea to be presently described.

(7) Infection of the ciliary body and anterior part of the choroid and retina is common, though cyclitis (evidenced by dots on posterior surface of the cornea) is rare. The entire posterior segment of the globe commonly escapes.

(8) The abundance of Hensen's bacillus at the sites of the leprous lesions is evidence of its importance in the pathology of the disease. It also proves that the interstitial keratitis is an essential part of the disease. By analogy, pending the discovery of the syphilitic microbe, we may argue that the interstitial keratitis of hereditary syphilis is an essential part of that disease, and we may also admit the possibility of a tubercular interstitial keratitis (as indeed has been demonstrated in a case here quoted). The distinction between these three diseases depends not upon their morbid histology which is very similar, but their course and associations which are very different. "Different chronic infections may cause similar corneal lesions, but since our ideas of the pathogeny of lesions have been rendered precise by bacteriology, do not let us overrate the importance of the lesions themselves." In other words, let us no longer talk of interstitial keratitis as a disease which may be caused by syphilis, by leprosy or by tubercle. Let us rather regard it as a symptom common to these and possibly to other diseases.

For the elucidation of their various points we must refer readers to the original article. We will only here summarise the author's description of leprous keratitis. Near the corneal margin, often at a point corresponding to preexisting lesions in the sclera, a slight haze appears, without any interference with the corneal reflex. A magnifying lens resolves the haze into a number of minute nodular opacities more or less confluent, situated principally between the superficial layers of the cornea or else just in front of Descemet's membrane. Near the margin the infiltration is denser, like an arcus senilis but smaller in

extent and reaching right up to the corneal margin. When this leprous keratitis is confined to one sector of the cornea it may clear up almost completely, but it generally recurs. When the whole cornea is attacked no return to complete transparency can be expected. Secondary glaucoma is not uncommon. In fact, whereas the interstitial keratitis of Hutchinson tends to recovery, the leprous form of the disease does not. An interstitial vascularisation of the cornea may or may not occur.

Anyone interested in this subject would do well to refer to the drawings of the microscopic appearances of the case examined by the authors with which this article is illustrated. The infiltration at the corneo-scleral junction and in the anterior layers of the cornea are demonstrated, and the structure of a small leprous nodule under Bowman's membrane with large cells full of bacilli is very well displayed. The description is very similar to that of two other cases anatomically examined by previous authors.

A. H. Thompson.

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**Dianoux.** Some of the Ocular Troubles of Diabetes. *Annales d'Oculistique, October,* 1898.

In this brief paper Dianoux only takes up three of the manifestations of diabetes in the eye; he does not pretend to cover the whole subject, and we refer to his article chiefly because some of his views, especially as regards prognosis, differ from those of many surgeons. He first takes up cataract, in regard to which he is doubtful whether diabetes has more than a mere predisposing action—in senile patients, that is to say. Of course this is not true in the case of young patients, in whom diabetes has a direct causative action, and in whom its presence

should always be suspected and searched for when cataract is discovered in an adolescent. But while Dianoux considers the prognosis after extraction in senile patients to be not materially different from the average, he appears to have less fortunate experiences with younger diabetics, for he has found such patients with soft cataract apt to die about the seventh or eighth day from pulmonary apoplexy, and even if they escape this, rarely to live longer than twelve to fifteen months. While there can be no question that the young diabetic who has cataract is in some danger, Dianoux's experience seems to have been more melancholy than that of most surgeons.

The second topic with which the author deals is the vascular lesions to which these patients are liable. Retinal hæmorrhages, he says (somewhat too boldly), are unknown in young diabetics, and only occur in those of more advanced life; along with them other signs of arterial degeneration, *e.g.*, tortuosity of the vessels, thickening of their walls, &c., are to be found. Among the patients a considerable number are apt to acquire albuminuria, and such are liable to a form of retinitis resembling, but not exactly similar to, the true albuminuric form; the expectation of life in such persons does not exceed six to twelve months.

Thirdly, central scotoma in diabetics, when it is not merely the manifestation of an ordinary toxic amblyopia in an individual whose resisting power is diminished by his enfeebled condition, has likewise a very evil significance as regards probable duration of life; the onset of diabetic coma is to be feared before long. The experience of most surgeons on this point is in accord with that of Dianoux.

W. G. S.

# AMERICAN MEDICAL ASSOCIATION—SECTION OF OPHTHALMOLOGY.

FORTY-NINTH ANNUAL MEETING HELD AT DENVER, 1898.
HAROLD GIFFORD, of Omaha, Chairman.

*Chairman's Address.*—In opening the meeting the chairman dwelt upon the predominance of German influence in modern medicine and surgery. This could only be explained by the greater incentive to scientific research furnished by the German environment, particularly the practice of calling men to professorships and other important positions, on account of original work; and from one city to another.

*Glioma of the Retina.*—J. L. Thompson (Indianapolis), reported 13 cases of this disease among 24,500 patients. Ten eyes were removed, but 3 too late to expect anything but relief of pain. Three patients were cured, and of 2 living within six months after operation, 1 showed no sign of recurrence, and 1 was likely to die. One of the fatal cases, dying after recurrence in the left eye after removal of the right,[1] was one of fourteen children; of whom five, two boys and three girls, died of "cancer of the eye" between the ages of $1\frac{1}{4}$ and $3\frac{1}{2}$ years. The other children all lived. The mother did not know her husband's people; but had heard there was a great aunt who died of cancer of the breast, who had three children who died of "cancer of the eye."

*Low Myopic Astigmatism with Sub-Conjunctival Hæmorrhage.*—Geo. M. Gould (Philadelphia) reported the case of a man aged 50, whose eyes had been pronounced

[1] The word *recurrence* is hardly correct here. The appearance of the growth in the second eye is probably always independent of that in the first, and, where it occurs, would not have been obviated by earlier removal of the first. For a comprehensive summary of the whole matter, see the abstract of Wintersteiner's work, OPHTHALMIC REVIEW, August, 1897.—ED. *O.R.*

"mathematically perfect"; who had suffered from subconjunctival hæmorrhages as often as once in two weeks for over a year, and who was relieved by the constant wearing of — 0·25 cyl. lenses for distance, with correction for presbyopia for near.

H. O. Reik (Baltimore) had seen a similar case relieved by wearing — 0·50 cyl. lenses, the patient being a woman aged 30.

*Pterygium.*—H. M. Starkey (Chicago) reported the results of treatment by the galvanic current, in about 38 cases. In all the pterygium was reduced in size, and in most cases the growth was entirely checked. In about 50 per cent. the cure was radical. In about 20 per cent. the growth recommenced, and some operation was necessary. The cases suitable for this method are those of small pterygia not encroaching much upon the cornea. It is not advised except as a palliative for others. It is applied by passing a fine platinum needle connected with the positive pole through and beneath the growth near its apex, and employing a current of 1 to 3 milliamperes for one or two minutes; and repeating with the needle introduced 2 mm. nearer the base. This coagulates the blood in the vessels, causing them to disappear, and produces a mild adhesive inflammation. The method avoids loss of tissue, is painless (under cocaine), does not incapacitate the patient, and stops the pterygium in its early stages.

*Faradism in Choroiditis.*—R. F. Le Mond (Denver) reported 3 cases of choroiditis with extensive opacities of the vitreous, in which faradism, employed five minutes daily, was followed by great improvement.

*Phlyctenular Keratitis.*—D. S. Reynolds (Louisville) from a study of this disease based upon 44 cases, endorsed Horner's view of the relation of this disease to eruptions of the skin and anterior nares; and that not local treatment but constitutional measures were to be alone relied on.

*Formalin for Blepharitis.*—H. Moulton (Fort Smith) had, for the last year, used formalin in all cases of blepharitis.

He applied it by a cotton mop wrapped round the end of a tooth-pick, dipped into solutions of 1 to 500, to 1 to 100, beginning with the weaker, and not using enough of the solution to run into the conjunctiva. The lid was drawn from the eye-ball and the mop rubbed gently along the margin among the lashes, until all the scales, crusts or tops of pustules were removed. The applications should be made daily. He finds it vastly superior to other remedies, improving all cases and curing some not benefited by other treatment.

*Lens Opacities and Age.*—Edward Jackson (Denver) found that among 1,545 patients over 50 years of age examined ophthalmoscopically, 449 showed some lens opacity. Arranged by five year periods, the percentages showing lens opacity were: 50 to 55, 15 per cent.; 55 to 60, 16·1 per cent.; 60 to 65, 30·2 per cent.; 65 to 70, 45·6 per cent.; 70 to 75, 54·2 per cent. and of just 100 upwards of 75 years old, 77 had lens opacity. But while age was an important factor it was probably for many cases only a predisposing cause of cataract. Toxic amblyopia was seven or eight times more frequent at 60 than at 30, yet no one thought of it as due wholly or chiefly to age.

*Slight Corneal Turbidity.*—H. Gradle (Chicago) called attention to a form of corneal cloudiness easily overlooked, being but an exaggeration of the normal turbidity of the cornea, and only detected by using a highly magnifying lens with lateral illumination. It could not be seen with the ophthalmoscope, still it reduced corrected vision below the normal. The patients complained of asthenopic symptoms, with more burning, smarting, or feeling of a "foreign body" than was usual in connection with refractive errors. He reported seven cases, in two of which the condition was confined to one eye. All the patients had refractive anomalies, but their correction did not give immediate relief. Inspersion of calomel was used in some of them, and ultimately all were comparatively relieved with wearing glasses.

*Bacteria in Eye Disease.*—E. O. Sisson (Keokuk) urged the importance of bacteria as one of the chief etiologic factors of diseases of the eye, and gave a *résumé* of the results of bacteriologic studies regarding diseases of the conjunctiva and cornea.

*Holocain.*—R. L. Randolf (Baltimore) presented conclusions from clinical and bacteriologic experiments with this drug. He found it an efficient local anæsthetic, quick in its action, and equal to cocain in stronger solutions used in the same way. It produced no drying of the cornea or dilatation of the pupil. Pus organisms exposed to the one per cent. solution (the strength used) were not only inhibited, but were killed, in a time not determined, but within twenty-four hours.

*Congenital Ectopia Lentis.*—E. F. Parker (Charleston) reported five cases occurring in three generations, in a woman and her mother, her two sons and a daughter. The dislocation was bilateral, and upward and outward. He also gave a *résumé* from the literature of the subject of eight other reported instances in which the anomaly had been found in from two to five generations.

W. H. Wilder (Chicago) reported three cases in two generations. A mother presented dislocation of the right lens upward and outward, the left upward and inward. Her daughter had a dislocation of the right outward, left upward and outward, and a son had both lenses dislocated inward.

*Microphthalmos.*—C. D. Wescott (Chicago) reported a case of double congenital microphthalmos. The parents were healthy. They had one older child, a girl born blind, who died of acute disease at eighteen months. This was a boy two years old. The right cornea was 6 or 7 mm. in diameter, with the pupil concealed by central corneal opacity. The left cornea was 5 or 6 mm. in diameter, and so opaque that the iris was barely perceptible through it. The child could see to go about, and was healthy. Movements of the eyes were limited, but otherwise normal. No

cysts could be demonstrated. The lids and orbits were normal.

*An Aluminium Artificial Vitreous.*—D. C. Bryant (Omaha), after using an aluminium ball instead of glass, because lighter and stronger, had the back and sides fenestrated, making it a frame, to allow it to fill with granulation tissue which would prevent its extrusion. Experiments on dogs showed that while there was some drawing-in of surrounding tissue, the main part of the cavity was filled with new tissue. He had used the ball in four, and the frame in sixteen cases, three-fourths of them enucleations. In the cases of enucleation there was little more reaction than after the ordinary enucleation, the recovery being rapid, without complications. In the eviscerations the healing process was prolonged, in one case extending over three months. In no case was there after trouble, tenderness, or irritation of the stump, and each wore an artificial eye with perfect comfort.

*Iritis Spongiosa.*—Adeline E. Portman (Washington) reported a case of this disease, and called attention to the distinct clinical picture it presented, in the exudate with its distinct edge, resembling a lens dislocated into the anterior chamber, after absorption begins. In the case reported the exudate had been present three days before absorption began, and then in two days it entirely disappeared, leaving the iris normal in appearance, except some adhesions.

*A New Perimeter.*—Chas. H. Williams (Boston) presented a modification of the perimeter, in which the fixation point and the test object were small electric lamps. The latter was made to travel at the desired rate along the arc by an electric motor, the motion of which could be easily reversed. A slide before the lamp allowed the use in front of it of apertures of different sizes, and different coloured glasses, or different densities of smoke glass.

*Tobacco and Quinine Amblyopias.*—E. C. Ellett (Memphis) reported two cases of tobacco and alcohol amblyopia in men, aged 26 and 28, who had smoked cigarettes exces-

sively from the age of 13, and who also used alcoholic beverages rather freely. One refused treatment and died a few months later of acute tuberculosis. The other, with vision reduced to $\frac{20}{200}$ and $\frac{3}{200}$, stopped tobacco and alcohol, and under treatment had, in eight months, recovered vision of $\frac{15}{20}$ partly in each eye. Vision remained unchanged nine months later, although he was drinking a little beer.

A man aged 30, who had smoked cigarettes excessively since 7 years of age, took for a tertian intermittent 120 grains of quinine in twelve hours, by which time deafness was complete, but passed off three hours later. The fourth morning afterward he awoke with sight very much impaired, and by 1 p.m. had lost all perception of light; it was not regained for three months. Vision then improved slowly and two years later had risen to $\frac{5}{200}$ and $\frac{1}{200}$. The discs showed white atrophy.

L. J. Lautenbach (Philadelphia) reported six cases of tobacco amblyopia, three of the patients using no alcohol, and three using it, but not to excess. He had not seen amblyopia caused by use of tobacco in any way but smoking; and had allowed patients who had chewed it to continue to do so during recovery. He believed it especially liable to occur during adolescence and early manhood.

*Amblyopia from Auto-Intoxication.*—H. B. Young (Burlington, Ia.) reported under this title four cases in which, in connection with constipation and serious digestive disturbance, coated tongue, and a peculiar foulness of breath, there occurred serious amblyopia, which was greatly improved by freely clearing the alimentary canal with calomel. The ages of the patients ranged from 12 to 59 years. Three were male, one female. The last had loss of light perception for some days with dilated unresponsive pupils; but recovered full vision in a month. Subsequently she had a milder attack which yielded to the same treatment. With the amblyopia there was in each case great despondency. Two more cases resembling these had been observed; but there was a suspicion that they were hysterical.

*Grafts to replace Conjunctiva.*—F. C. Hotz (Chicago), who had used successfully Thiersch skin-grafts for replacing the ocular conjunctiva, had tried a graft of mucous membrane from the lip, as recommended by Gifford. The strip used was 15 mm. long and 5 mm. wide; not wide enough to cover the whole space denuded by the removal of a vascular growth from the nasal side of the cornea. The strip was placed a little back from the cornea, and the ends were fastened by very fine silk sutures. Hotz had noted that epithelial grafts placed quite up to the corneal margin became slightly displaced on to the cornea by the lateral movements of the globe, before they became fixed. The graft adhered well, and became quite like the adjoining conjunctiva. It was cut under local anæsthesia by holocain.

*Lacrymal Obstruction.*—L. Connor (Detroit) pointed out some sources of failure in treating lacrymal obstruction. (1) The overlooking of its causation by constitutional disease, especially syphilis, tuberculous and scrofulous disease. (2) Failure to recognise eye-strain as a cause of epiphora, by extension of conjunctivitis, by misplacement of the puncta by muscular action of the lids, and by interference with the normal propulsion of the tears through the canaliculi by the lid muscles. (3) Overlooking morbid conditions in the nares involving the opening of the duct into the nose. (4) Faulty technique as, opening the canaliculus improperly or too extensively, opening the lower instead of the upper canaliculus, undue violence, timidity, and rigid ideas respecting the proper shapes and sizes of probes.

Melville Black (Denver) reported on the use of large probes in true stenosis of the lacrymal duct where mild measures and nasal treatment were of no avail. He slit the upper canaliculus and passed the largest probe that could be introduced. This was passed daily the first ten days, then at lengthening intervals. Once a week for the first six weeks the probe was connected with the negative pole and a galvanic current of 2 or 3 milliamperes passed for ten minutes.

H. O. Reik (Baltimore) reported on the value of the large probes. In 130 cases treated with the Theobald probes about 15 per cent. failed to continue the treatment. Of the others all but three were regarded cured when treatment was stopped; and of 39 heard from after one to eight years but two had relapsed. The No. 16 probe was used on 75 per cent. of the cases.

*Obliteration of the Lacrymal Sac.*—H. E. Prince (Springfield, Ill.), accomplishes this for the treatment of chronic suppurative dacryo-cystitis as follows:—A probe is introduced through the canaliculus into the sac, and the point directed toward the skin; which is then incised over it, and the incision enlarged to the entire length of the sac. Any sinuses are opened; and monochloracetic acid applied over the exposed surfaces of the sac and sinuses. The wound is then kept packed with iodoform until the healing is complete.

*Glaucoma.*—H. Bert Ellis (Los Angeles) reported two cases of acute glaucoma, in one of which the first outbreak immediately followed a fit of coughing during which something seemed to snap in the eye. The crystalline lens was found dislocated downward and backward.

Herbert Harlan (Baltimore) reported a case of hereditary glaucoma in the cousin of a patient operated on thirteen years before, their mothers being sisters. The first patient, at the time of operation, was 17 years of age. Her mother was blind with glaucoma, which began when she was 19, and made her totally blind a year or more later. The mother's father lost his eyes in the same way, beginning at 18. His mother and grandmother had the same history. A maternal uncle at 35 had pain in the eyes and head, and in three years his sight was gone. The mother of the second patient saw well until 18, and then became blind. One cousin in a blind asylum began to lose her sight at 16. Another cousin had one eye enucleated and an iridectomy done on the other.[1]

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[1] It is very desirable that those who meet with instances of hereditary primary glaucoma should make accurate measurements of the cornea, in

*Binocular Fixation.*—G. C. Savage (Nashville) believes that binocular fixation is dependent on a guiding sensation, the home of which is in an area of the retina, including the fixation point and extending $1\frac{1}{2}°$ above and below it, 4° to the nasal and 15° or 20° to the temporal side. In testing for heterophoria he would use prisms strong enough to throw the false image out of this region.

F. B. Tiffany (Kansas City) reported the results of testing the balance and powers of the extrinsic ocular muscles in 100 healthy medical students.

*Advancement for Squint.*—C. H. Beard (Chicago) used advancement rather than tenotomy in all cases of squint suitable for operative treatment. Of 158 cases 111 were cured. On 70 of these patients were done 81 advancement operations, 57 of the externus muscle for convergent squint, and 24 of the internus. In 32 cases the strabismus yielded to atropine and glasses; and 9 cases were relieved by these, combined with orthoptic training.

*Absorbable Sutures for Muscle Advancement.*—John O. McReynolds (Dallas, Texas) preferred for the slighter advancement operations, catgut, which was practically absorbed in three or four days. But for greater effects he preferred kangaroo tendon, because it was not absorbed for two or three weeks, and did not weaken rapidly from contact with the tissues.

*Accidents in Eye Operations.*—F. C. Heath (Indianapolis reported such accidents, including extensive irido-dialysis from the patient moving during iridectomy; extensive hæmorrhage from the iris after iridectomy for extraction, compelling the making of the capsulotomy and extraction of the lens "in the dark"; failure to remove all cortex in another case, followed by cyclitis and sympathetic inflammation in the other eye; and failure to extract

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both generations when possible, so as to ascertain whether this form of the disease is or is not commonly dependent on subnormal dimensions of the eyeball. See a case of this kind reported in the OPHTHALMIC REVIEW (1894, vol. xiii., p. 215).—ED. *O.R.*

through swinging back of a loose lens into softened vitreous.

*New Instruments.*—Geo. M. Gould (Philadelphia) presented a new form of ophthalmoscope with full series of lenses without a rekoss disc; and an "auto-fundoscope" consisting of a disc, with pin-hole 2 mm. from its axis, geared for steady rotation to exhibit the network of vessels at the centre of the macula.

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## COLLEGE OF PHYSICIANS OF PHILADELPHIA. SECTION ON OPHTHALMOLOGY.

Dr. George C. Harlan, Chairman.

Meeting, November 15, 1898.

*Rupture of the Iris and Choroid.*—Dr. B. A. Randall reported the case of a boy struck in the eye by a stone three days before, in which there was partial paresis of the iris above and a pupillary neck below, and in the choroid near the disc three nearly parallel linear lesions. These streaks seemed not real ruptures of the coat but torsion injuries. There was neither extravasation nor uncovering of the sclera in the affected areas, but merely yellow streaks. The macula was uninjured and V. nearly normal. Each lens showed a tiny extra-nuclear opacity, more pronounced on the uninjured side. They were probably congenital, but might readily be ascribed to the injury, and hence from a medico-legal point of view assume considerable importance. (The patient has since been seen, twenty-six days after injury, and already showed nearly the typical appearances of choroidal rupture with pigmentation of the margins.)

*Value of Pilocarpine in the Treatment of Diseases of the Interior of the Eye.*—Dr. R. R. Tybout detailed a case of violent irido-cyclitis in a man aged 31, who had general ciliary injection, contracted pupils, extensive posterior synechiæ, and deposits on the posterior surface of the cornea. T. + 1. V.: R. $\frac{6}{60}$, L. $\frac{6}{24}$. The patient had been infected with syphilis five years before and had been treated with mercury and iodides. Vision still further declined under a continuance of these remedies. After twenty-one hypodermic injections of gr. $\frac{1}{8}$ of pilocarpin muriate, extending over seven weeks, and gr. 60 potassium iodide daily with mercury occasionally, improvement was rapid and pronounced. V. increased to R. $\frac{6}{24}$, L. $\frac{6}{15}$. There were no relapses, tension became normal, and the exudation was promptly absorbed. Six months later V. had increased to R. $\frac{6}{9}$, L. $\frac{6}{6}$ with —·50° Ax. 90°.

Also two cases of episcleritis, both treated with pilocarpine *locally*, and one internally. In the first case, a woman aged 31, the inflammation had persisted for four weeks, and recovery ensued under pilocarpine sweats in two weeks. She had no relapses during the following month that she continued under observation. In the second case, a woman aged 27, the pain and signs of inflammation which had continued for eight weeks yielded to salol internally and pilocarpine locally, but much less promptly.

*Toxic Chromatopsia and Toxic Hysteria.*—Dr. de Schweinitz related the history of a patient, aged 51, who asserted that his left eye had always been defective in vision and had practically been blind for eleven years, and whose right eye for eight weeks previous to examination had been affected with marked xanthopsia in the form of clouds of orange-coloured smoke which passed constantly before it. With the exception of catarrh of the stomach, the patient presented no constitutional ailments, but had always been an excessive smoker and for part of his life a chewer of tobacco. He did not use spirits in any form. There was a typical relative central scotoma in the right eye, and in

the left, or supposed blind eye, a scotoma for white could also be demonstrated in the centre of the light-field, which in its periphery was normal, just as the form-field in its periphery was normal on the other side. Under a regimen which consisted in abstinence from tobacco, full doses of iodide of potassium and strychnia, the patient improved, and in six weeks returned with the vision of the right eye normal, the chromatopsia gone, and the scotoma no longer demonstrable, or at least, only a slight depreciation of colour-sense in the old scotomatous area. Tests for feigned monocular blindness were now perfectly successful, and by all ordinary methods it was positively shown that the patient read as well with his left as with his right eye. There had never been any ophthalmoscopic changes of gross disease, probably only a slight flushing of the optic discs. There was also partial hemi-anæsthesia of the face. The speaker compared the case to various forms of toxic hysteria as they are seen under the influence of lead, alcohol, mercury, bisulphide of carbon, and nitro-benzol. So far as his experience went, xanthopsia as a symptom of the toxic action of tobacco had been observed only once before.

*Study of 287 Cases of Hyperphoria.*—Dr. W. C. Posey endeavours to measure the deviation which the eye undergoes when it is screened off in the ordinary refraction test, whilst the other eye fixes the test-cards sharply in the endeavour to obtain the best visual acuity. To accomplish this, the vision of the right eye is first obtained, the left eye being obscured by an opaque disc. This done, the right eye is obscured by the disc and the left eye made to regard the chart. So soon as the vision of this eye has been obtained, instead of removing the shield from before the right eye and permitting the patient to bring the eyes into a state of parallelism by the unconscious desire for fusion consequent upon binocular vision, the patient is told to regard a bright electric light placed on a level with the line of test letters which he has just read and but a few inches from it, the right eye still being covered. The

Maddox rod is then lowered before the left eye, the patient's attention called to the streak, the disc quickly removed from before the right eye and the patient requested to give the relative positions of the light and the streak; and deviations, lateral or vertical, are at once measured by means of the rotary prisms which are in position before the eyes. He found:—

(1) Hyperphoria of 1° or more exists in about 13 per cent. of all cases of refraction, and as regards its frequency, is independent of associated exophoria, esophoria, or lateral orthophoria. Hyperphoria occurred most frequently to the extent of 2°. (2) In general the degree of hyperphoria seems to bear a close relationship to the degree of esophoria and exophoria in any case, increasing or diminishing in proportion as the lateral muscular deviation increases or diminishes, but a high degree of esophoria or exophoria does not necessarily imply the presence of hyperphoria. (3) In like manner, high degrees of ametropia need not be accompanied by hyperphoria, for the author found an equal number of cases of both M. and H. of high degree in which hyperphoria was absent. In these latter cases, however, it was noted that there was but a slight deviation in the lateral muscles, while on the other hand it was found that high degrees of ametropia, associated with high degrees of lateral heterophoria, were almost always attended with hyperphoria. (4) In anisometropia, on the other hand, hyperphoria is present in all cases where the difference in refraction between the eyes is at all marked, even when associated with a moderate degree of esophoria or exophoria. When there is lateral orthophoria, or but little difference in refraction between the eyes, hyperphoria is rarely present. (5) Strabismus, both convergent and divergent, is invariably accompanied by hyperphoria, of which at least one-fourth of its total amount is latent. (6) Latent hyperphoria is common and occurs independently of the state of the lateral muscles, although it is more frequent in exophoria (2 per cent.) than esophoria ($1\frac{67}{100}$ per cent.) or in lateral orthophoria ($\frac{1}{18}$ per cent.). (7) Unlike latent H., latent hyperphoria develops quite independently of age.

(8) The correction of errors of refraction is not sufficient in the majority of cases to bring about a disappearance of any existing hyperphoria, as the author has found that hyperphoria becomes more manifest the longer glasses are worn, whether vertical prisms have been incorporated into the formula or not. (9) Supra-orbital headache is the most frequent symptom. In a small proportion of cases it will be unilateral, usually on the same side as the eye with the lower vision. Typical attacks of migraine may be expected in about 5 per cent. of all cases of hyperphoria. A symptom of frequent occurrence and of great value in directing the attention to the existence of hyperphoria consists in an associated reflex in the supply of the facial nerve. This may manifest itself either in a unilateral twitching of the lids as in nictitation, or more rarely by pronounced blepharospasm.

HOWARD F. HANSELL,
*Clerk of Section.*

# OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

H. R. Swanzy, F.R.C.S.I., President, in the Chair.

Thursday, December 8, 1898 (Clinical Evening).

*Renal Retinitis.*—Mr. Nettleship showed a microscopical drawing. Pigmentation of the retina was known to occur in cases of renal retinitis where the disease was either severe or of long standing; it was generally seen near the periphery, but if the case lasted long enough it was found near the disc. The case from which the drawing had been taken had been observed during life, and the pigmentation had been noted. After death the eyes had been examined. A number of oval or round cells, with amorphous *débris*, the remains of an inflammatory exudation, were found in the retina between the bacillary layer and the hexagonal pigment layer in different places; these foci contained pigmented cells derived from the pigment epithelium, probably by proliferation.

*Sympathetic Ophthalmia beginning Fourteen Days after Excision of the Injured Eye.*—Mr. Holmes Spicer showed a boy aged 10, who was struck in the left eye on July 4 by a piece of sardine tin; there was a jagged wound of the cornea not involving the ciliary region; the anterior chamber was filled with blood, and the deeper parts could not be seen. A week later a piece of entangled iris was removed from the wound by iridectomy; the lens was found to be wounded. The eye remained painful and much congested and iritis set in, and it was excised on July 25, three weeks after the injury. The patient remained in hospital till August 6. Two days later there was slight ciliary injection of the right eye, fourteen days after excision. He was taken into hospital again: T. was —2, V. $\frac{6}{36}$; the pupil was well dilated; there was no deposit on the back of the cornea; there was much floating matter in the anterior part of the vitreous; there was no optic neuritis. He was treated with atropine

and mercurial inunction. The tension had now become normal, and the vision was $\frac{6}{9}$.

*An Unusual Form of Marginal Keratitis.* — Mr. John Griffith and Dr. Blair showed a case. The condition had existed for several years, and was associated with eczema of the face; the keratitis was symmetrical, attacking the inner and outer margins of each cornea close to the limbus. The lesions were slightly raised, vascular, and in three out of four limited by a curved line of opacity. It bore some resemblance to phlyctenular keratitis, but its persistence, absence of ulceration, and want of symptoms excluded this disease. It resembled spring catarrh, but the palpebral conjunctivæ were quite healthy.

*Pulsating Exophthalmos with Visible Tumour.*—Mr. W. J. Cant showed a man, aged 36, who was kicked on outer part of the left eyebrow eight years ago. Eighteen months ago he had pain over the right eyebrow with vomiting; the sight became dim, and he had diplopia. Gradually a swelling appeared at the upper inner angle of the right orbit, and he was conscious of a loud whistling sound in the head; as the swelling increased the sight returned and the diplopia ceased. R. E. V. $\frac{6}{6}$ J. 1, proptosed 8 mm. There were large tortuous veins on the ocular conjunctiva; a pulsating movable tumour diminished by pressure on the carotid; a loud *bruit* could be heard over the region of the tumour. There was no diplopia; the pupil acted normally; the retinal veins were enlarged, tortuous, and pulsating. He had been treated with rest, low diet, iodide of potassium, and digital compression with considerable benefit.

*Symmetrical Choroiditis in the Early Stage.*—Mr. Hartridge showed a man, aged 23, who first had dimness of sight five months ago; the sight had been progressively failing since. Family history good; personal health good; no history of syphilis. V. R. $\frac{6}{36}$, L. $\frac{6}{12}$. Both optic discs swollen and blurred; a large choroidal hæmorrhage on the outer side of each disc, œdema of the retina over

the whole central region, with a number of small circular exudations in the superficial layers of the choroid; urine normal.

*Atrophy of the Choroid with Sclerosis of the Choroidal Vessels.*—Mr. Ernest Clarke showed a man, aged 53, who first attended the Central London Ophthalmic Hospital four years ago with the history that his sight had been gradually failing for a year. He had been a heavy drinker and had had syphilis. He had well-marked optic neuritis in both eyes, and vision was reduced to fingers at a metre in both eyes; there was no history of night blindness. The following changes had been gradually coming on since then, and the present condition of the eyes was: atrophy of the optic nerve and retina, atrophy of the epithelial pigment and of the chorio-capillaris, which allowed the vessels in the tunica vasculosa to be well seen; sclerosis of many of the choroidal vessels, especially on the temporal side of the posterior pole of each eye. The periphery of the retina showed pigmentation like that of retinitis pigmentosa. Large flocculent vitreous opacities. Vision reduced to perception of light.

*Myxo-Sarcoma of the Orbit.*—Mr. Juler showed a female, aged 20, who first had diplopia in May, 1897; in February, 1898, the left upper lid began to droop and the eyeball was turned downwards and proptosed; the displacement of the eye increased till June 15, when there was marked ptosis and proptosis, the movements of the globe being limited. The tumour was soft and fluctuating, but contained two hard nodules. The skin of the face was sprinkled with brown and blue pigment spots which had always been present. On June 25, the contents of the orbit were removed after puncture by a trocar and cannula had given exit to several drachms of clear gelatinous fluid which came from a cyst in the growth. After removal the bone of the roof of the orbit was found eroded, and an aperture led to the dura mater. Last month there was a recurrence beneath the upper lid. Microscopically the tumour presented the appearances of a myxoma, but

the invasion of the frontal bone and the recurrence indicated that it was probably sarcomatous. It consisted of stellate branching cells, round cells and blood vessels; within the meshes of the tissue was a large amount of mucin.

*Congenital Absence of Choroid.*—Dr. Tatham Thompson showed a man, aged 18, with V. $= \frac{20}{200}$, a dazzling white sclera being seen all over the fundus except at the macula; there were a few isolated choroidal vessels only.

*Tumour of Iris.*—Mr. A. H. Thompson showed a patient with a small tumour, probably a sarcoma, projecting from the anterior surface of the iris.

*Injury to Cornea.*—Mr. W. H. Jessop showed a case. A large flap turned back from the upper margin of the cornea had become reapplied and united.

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